HEC's Flood Damage Analysis (HEC-FDA) Program

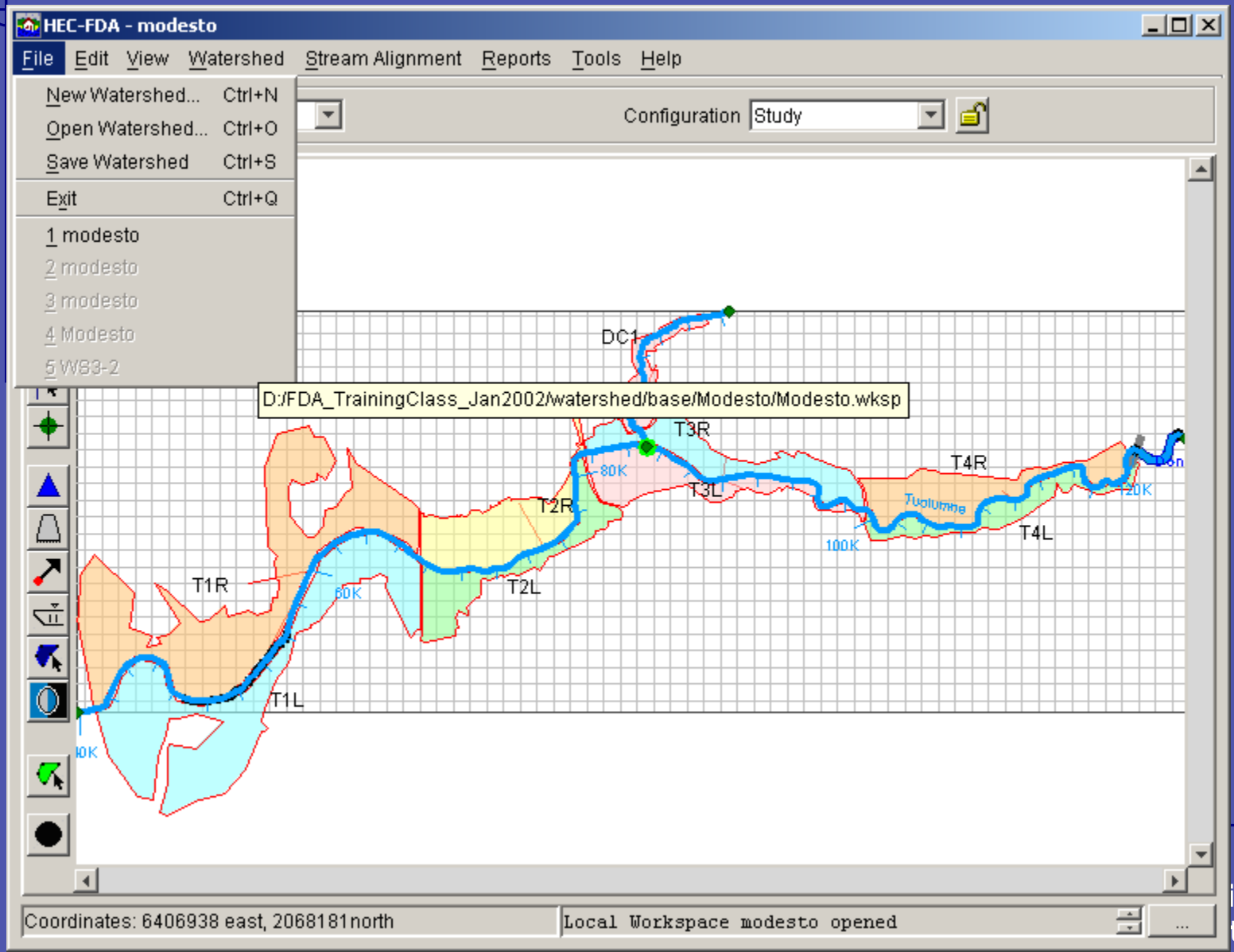
“Blended” HEC-FDA 2002

- Performs Comprehensive Flood Impact Analysis
- Merges the Capabilities of
  - HEC-FDA (Version 1.x)
  - HEC-FIA (Version 1.0)
- Adds New Functionality
  - Computations
  - Spatially Referenced Data
  - Interactive Analysis
  - Displays
- New GUI (Graphical User Interface) **Brace Yourselves!**

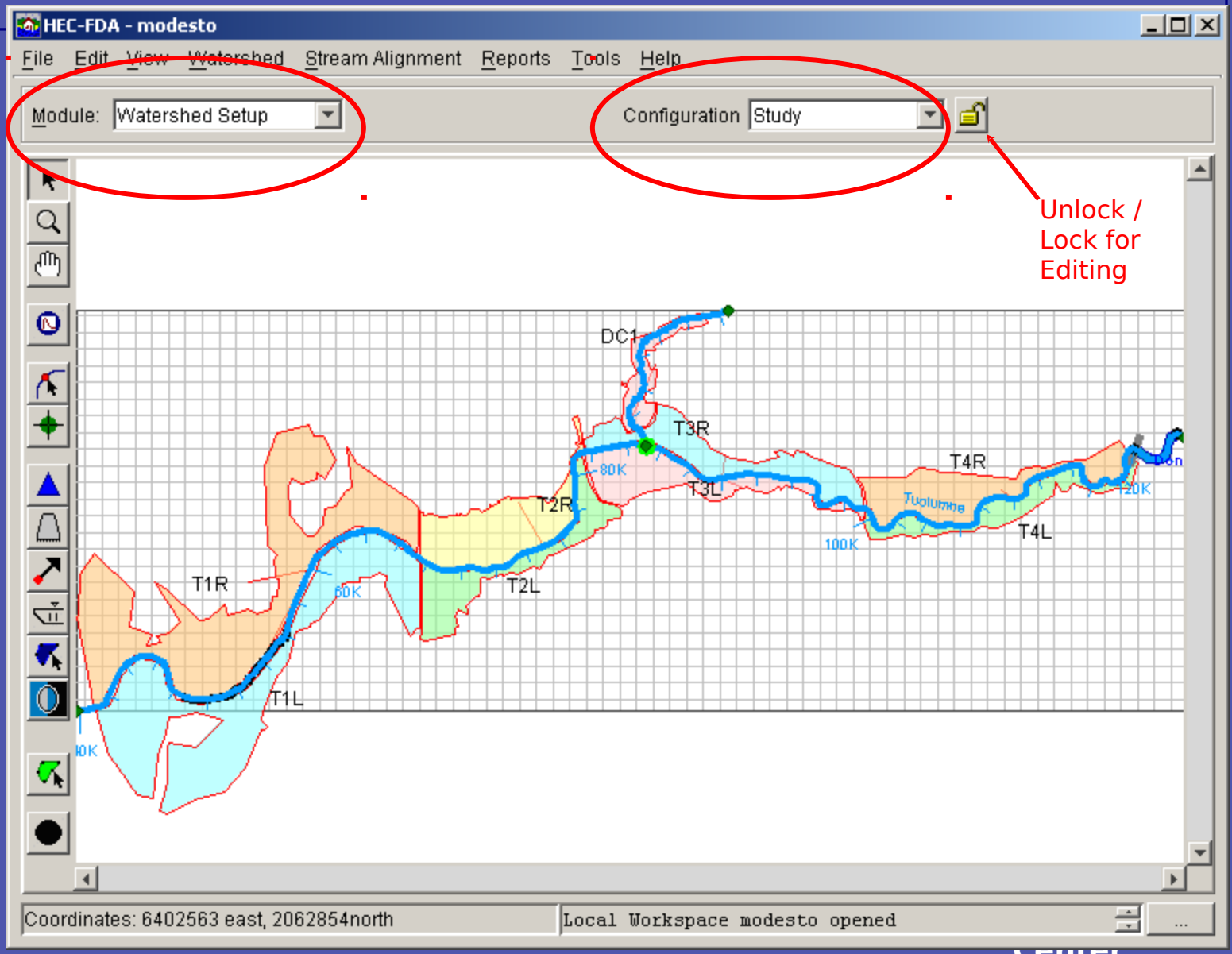
HEC-FDA GUI Design

- Watershed Setup Module
- Inventory Module
- Model Configuration Module
- Risk Analysis Module
- Event Analysis Module
- Interactive Analysis Module

Opening / Creating a Watershed



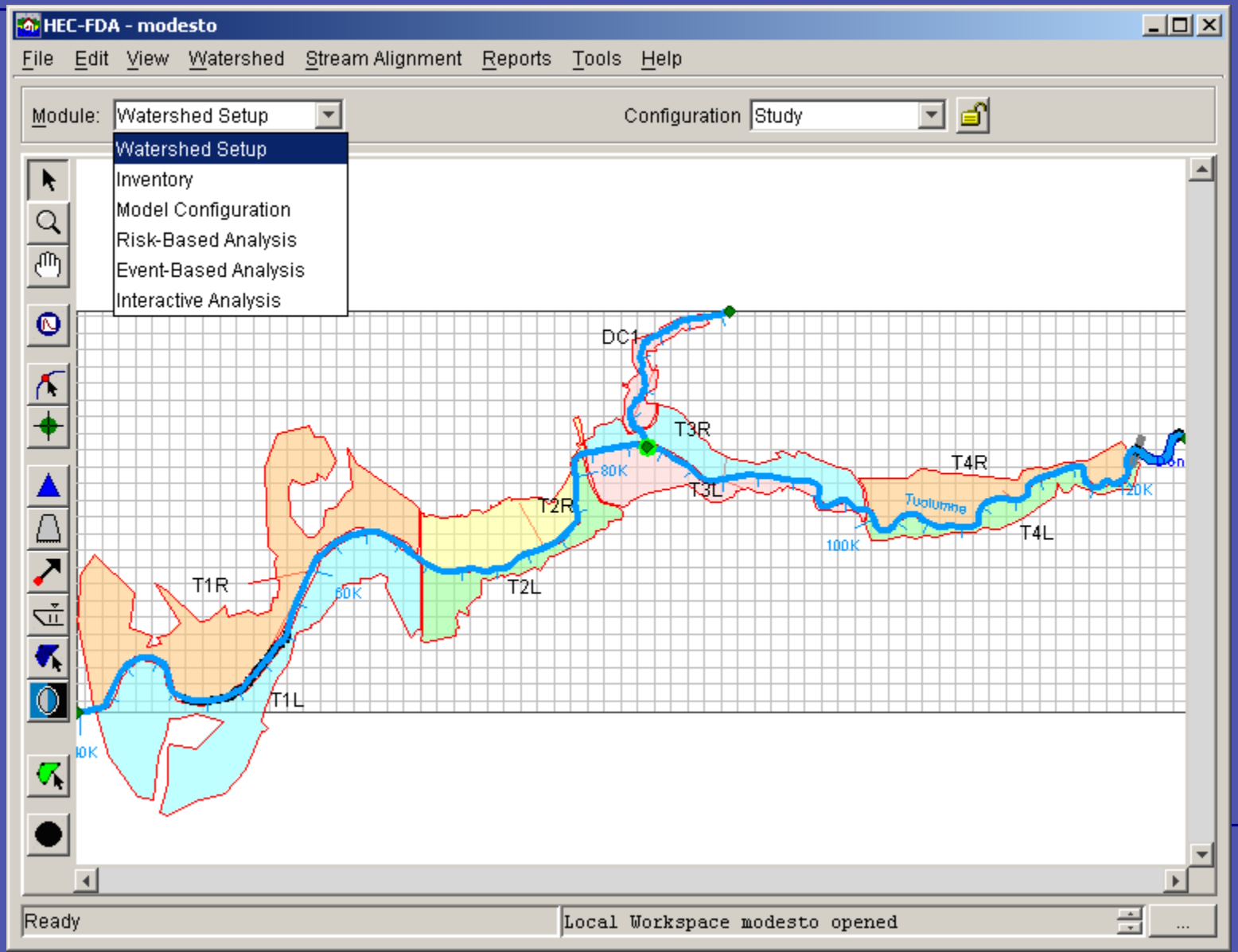
Modules & Configurations



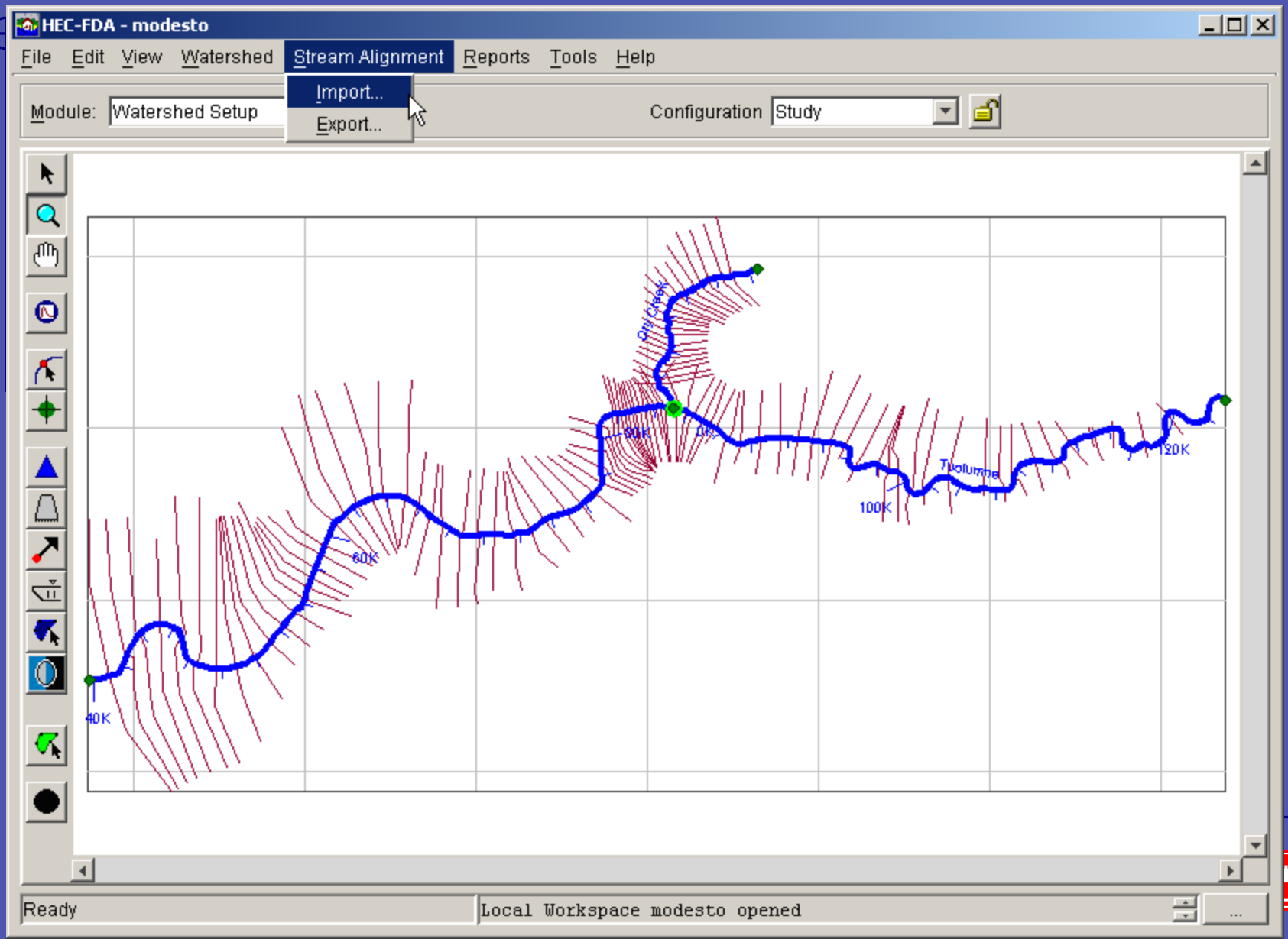
Watershed Setup Module

- Stream Alignment
- Impact Areas (Damage Reaches)
- Configuration(s)
- Other
  - Hydrograph Locations
  - Project Locations
    - Reservoirs
    - Levees
    - Diversions
    - Channel Improvements
  - Analysis Years

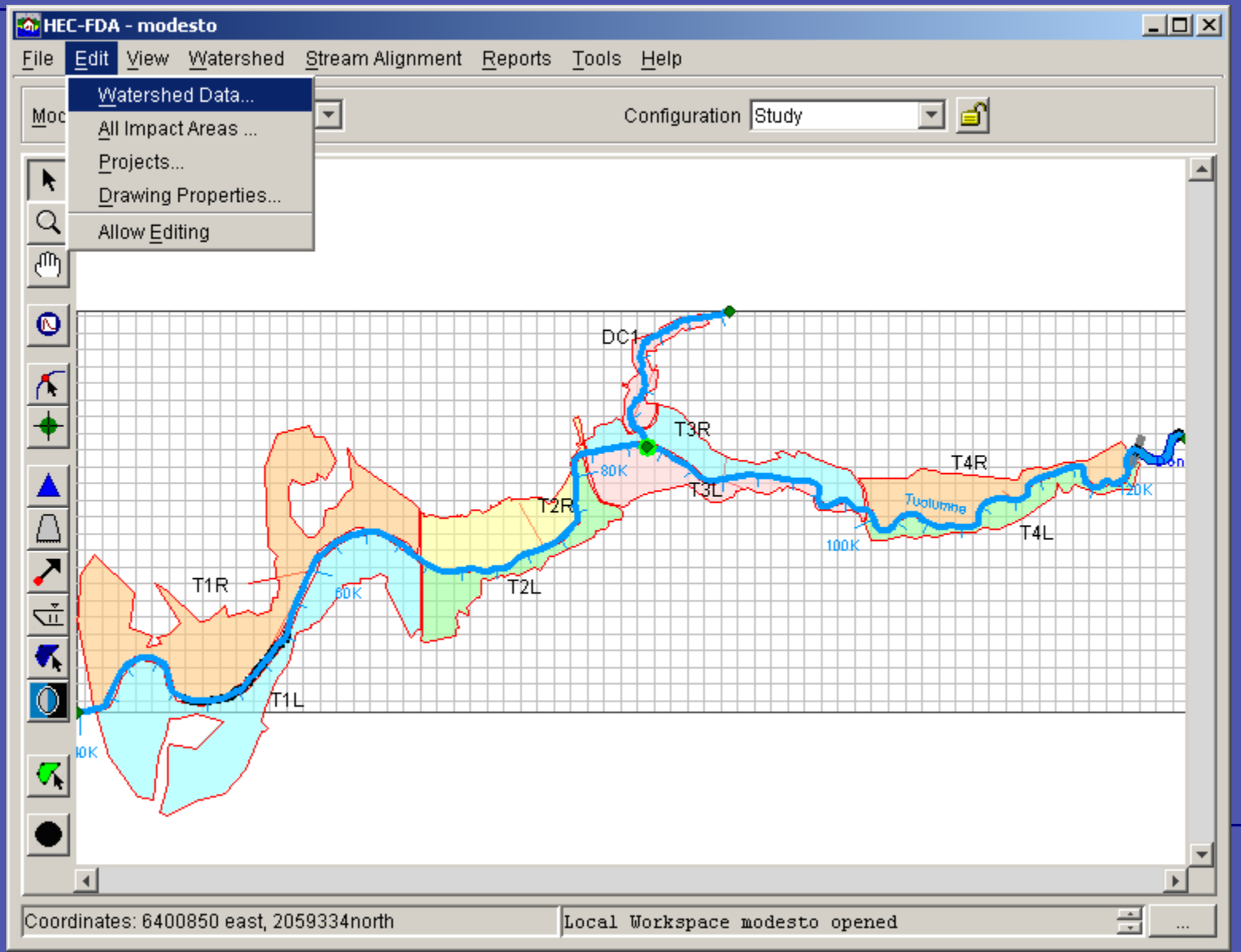
Selecting Watershed Setup Module



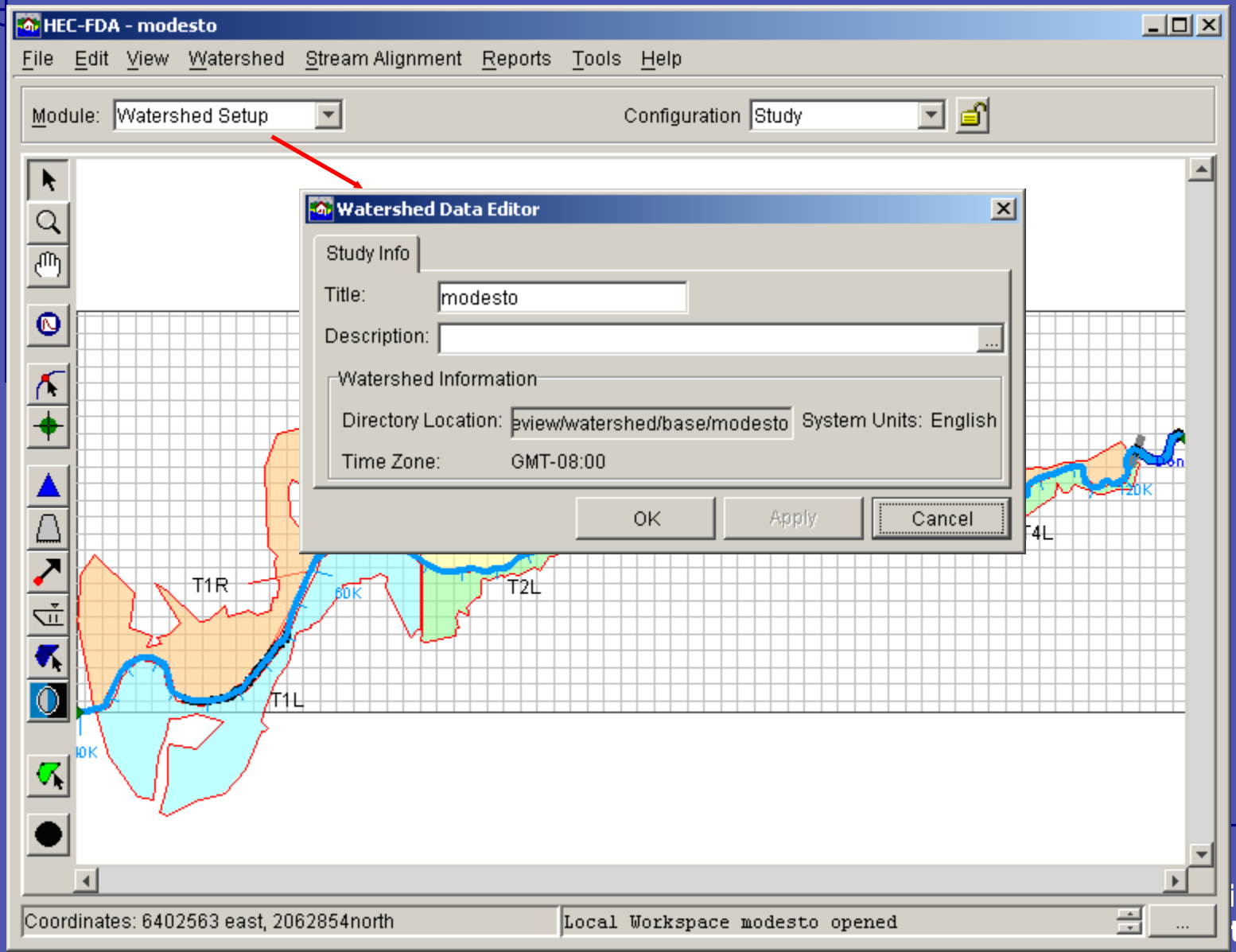
Stream Alignment



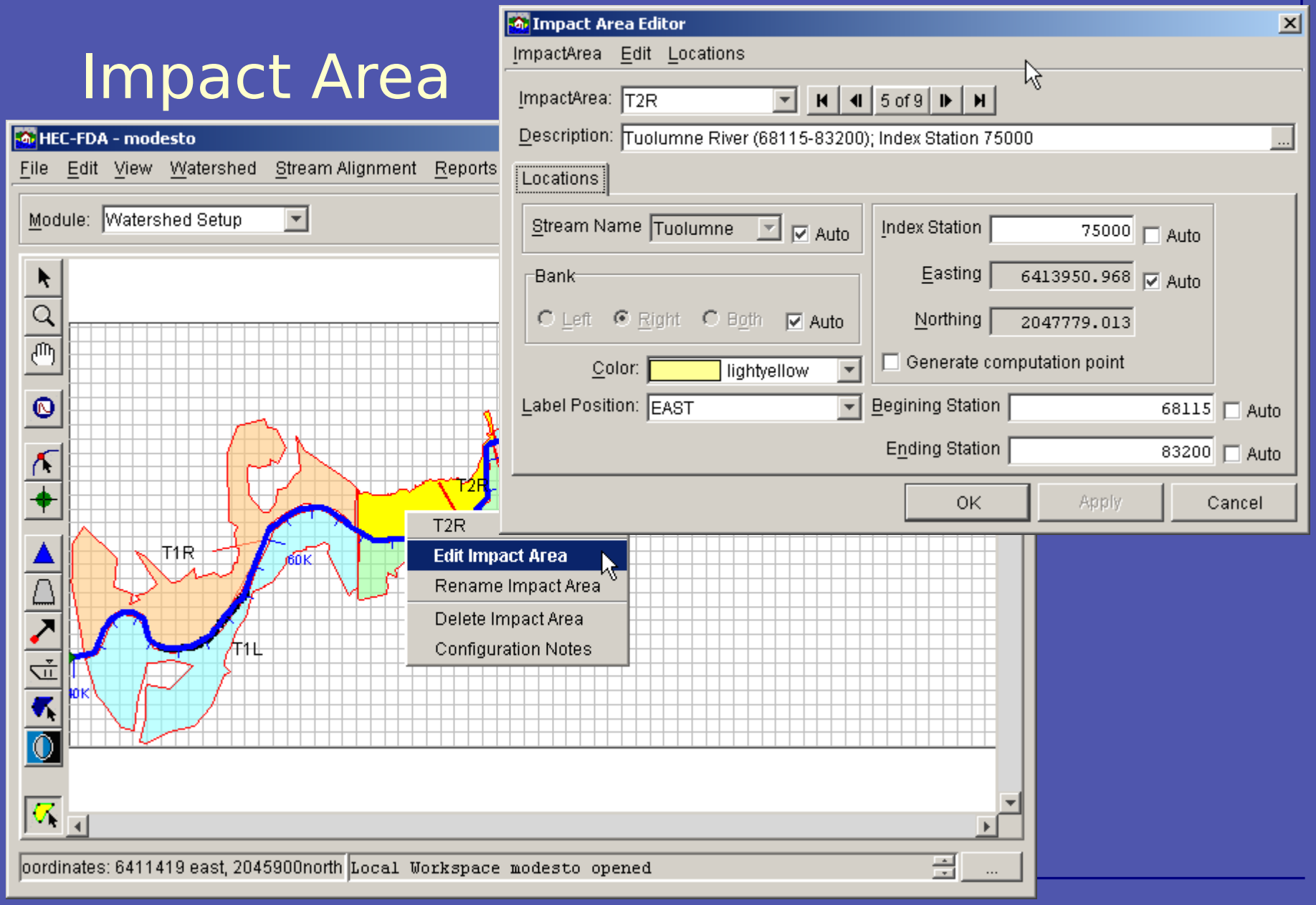
Edit Watershed Data



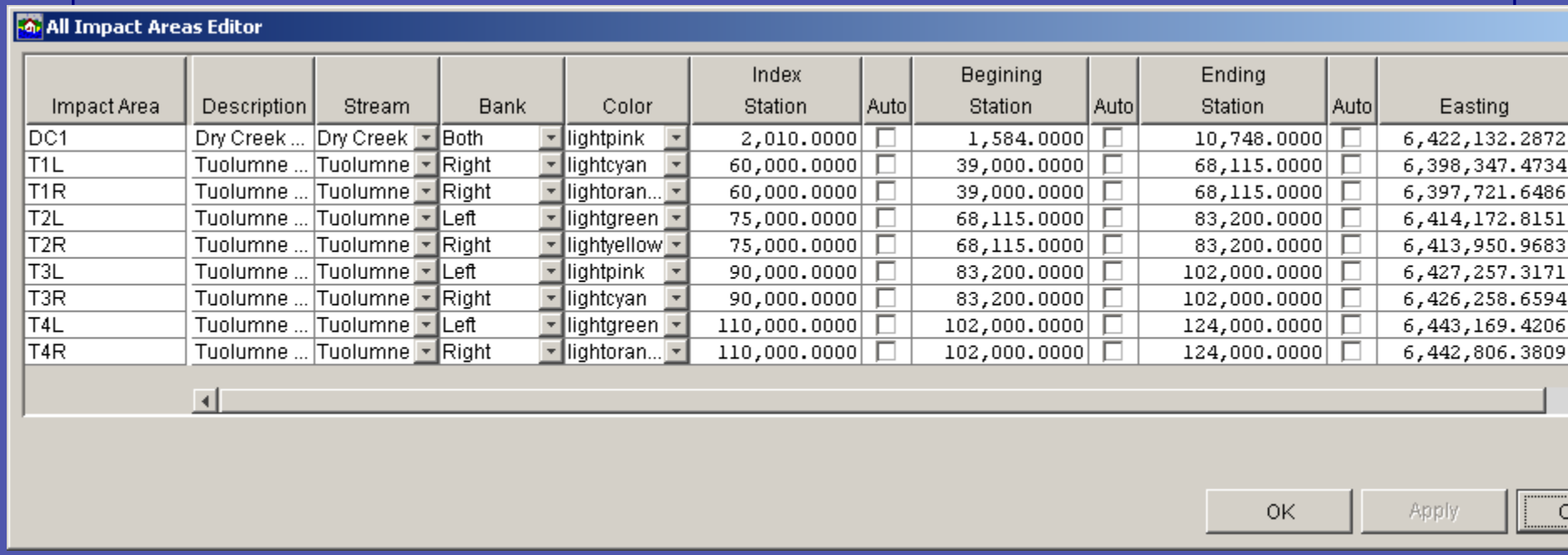
Watershed Data Editor



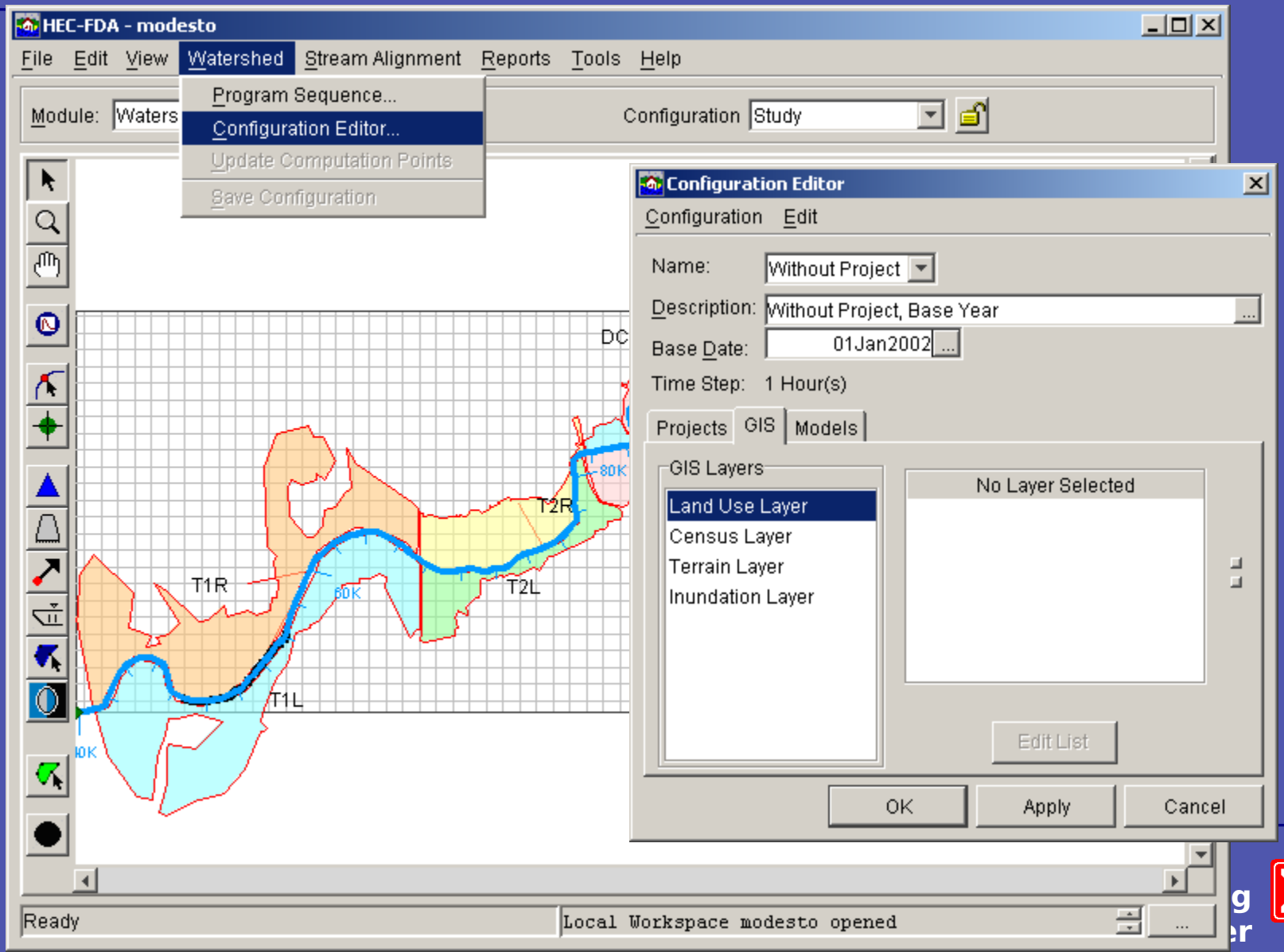
Impact Area


Impact Area Editor
ImpactArea Edit Locations
ImpactArea: T2R
5 of 9
Description: Tuolumne River (68115-83200); Index Station 75000
Locations
Stream Name Tuolumne Auto
Bank
Left Right Both Auto
Color: lightyellow
Label Position: EAST
Index Station 75000 Auto
Easting 6413950.968 Auto
Northing 2047779.013
Generate computation point
Begining Station 68115 Auto
Ending Station 83200 Auto
OK Apply Cancel
HEC-FDA - modesto
File Edit View Watershed Stream Alignment Reports
Module: Watershed Setup
T2R
T1R
T1L
60K
T2R
Edit Impact Area
Rename Impact Area
Delete Impact Area
Configuration Notes
oordinates: 6411419 east, 2045900north
Local Workspace modesto opened

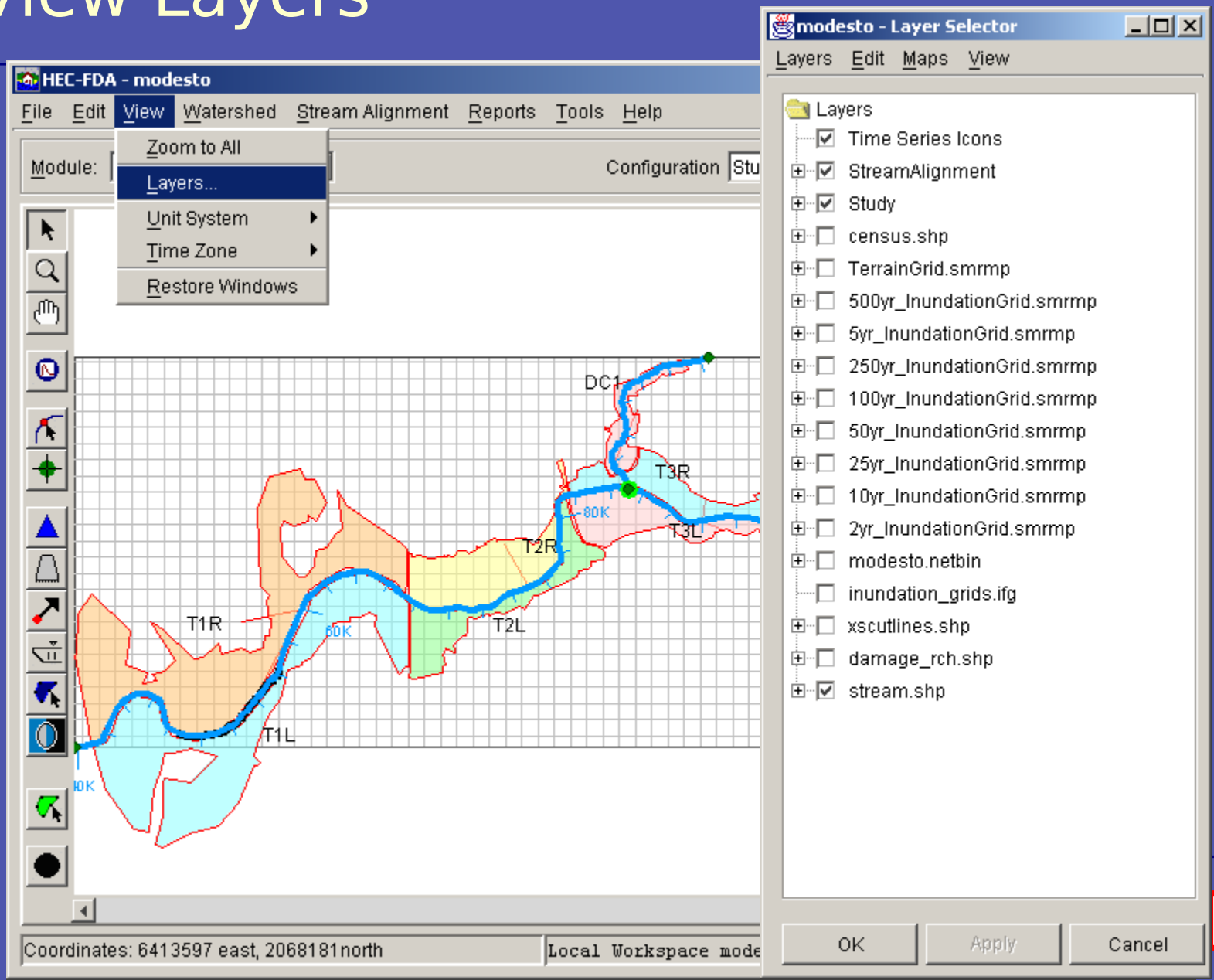
Edit All Impact Areas


All Impact Areas Editor
Impact Area
Description
Stream
Bank
Color
Index Station
Auto
Begining Station
Auto
Ending Station
Auto
Easting
DC1 Dry Creek ... Dry Creek Both lightpink 2,010.0000 1,584.0000 10,748.0000 6,422,132.2872
T1L Tuolumne ... Tuolumne Right lightcyan 60,000.0000 39,000.0000 68,115.0000 6,398,347.4734
T1R Tuolumne ... Tuolumne Right lightoran... 60,000.0000 39,000.0000 68,115.0000 6,397,721.6486
T2L Tuolumne ... Tuolumne Left lightgreen 75,000.0000 68,115.0000 83,200.0000 6,414,172.8151
T2R Tuolumne ... Tuolumne Right lightyellow 75,000.0000 68,115.0000 83,200.0000 6,413,950.9683
T3L Tuolumne ... Tuolumne Left lightpink 90,000.0000 83,200.0000 102,000.0000 6,427,257.3171
T3R Tuolumne ... Tuolumne Right lightcyan 90,000.0000 83,200.0000 102,000.0000 6,426,258.6594
T4L Tuolumne ... Tuolumne Left lightgreen 110,000.0000 102,000.0000 124,000.0000 6,443,169.4206
T4R Tuolumne ... Tuolumne Right lightoran... 110,000.0000 102,000.0000 124,000.0000 6,442,806.3809
OK
Apply

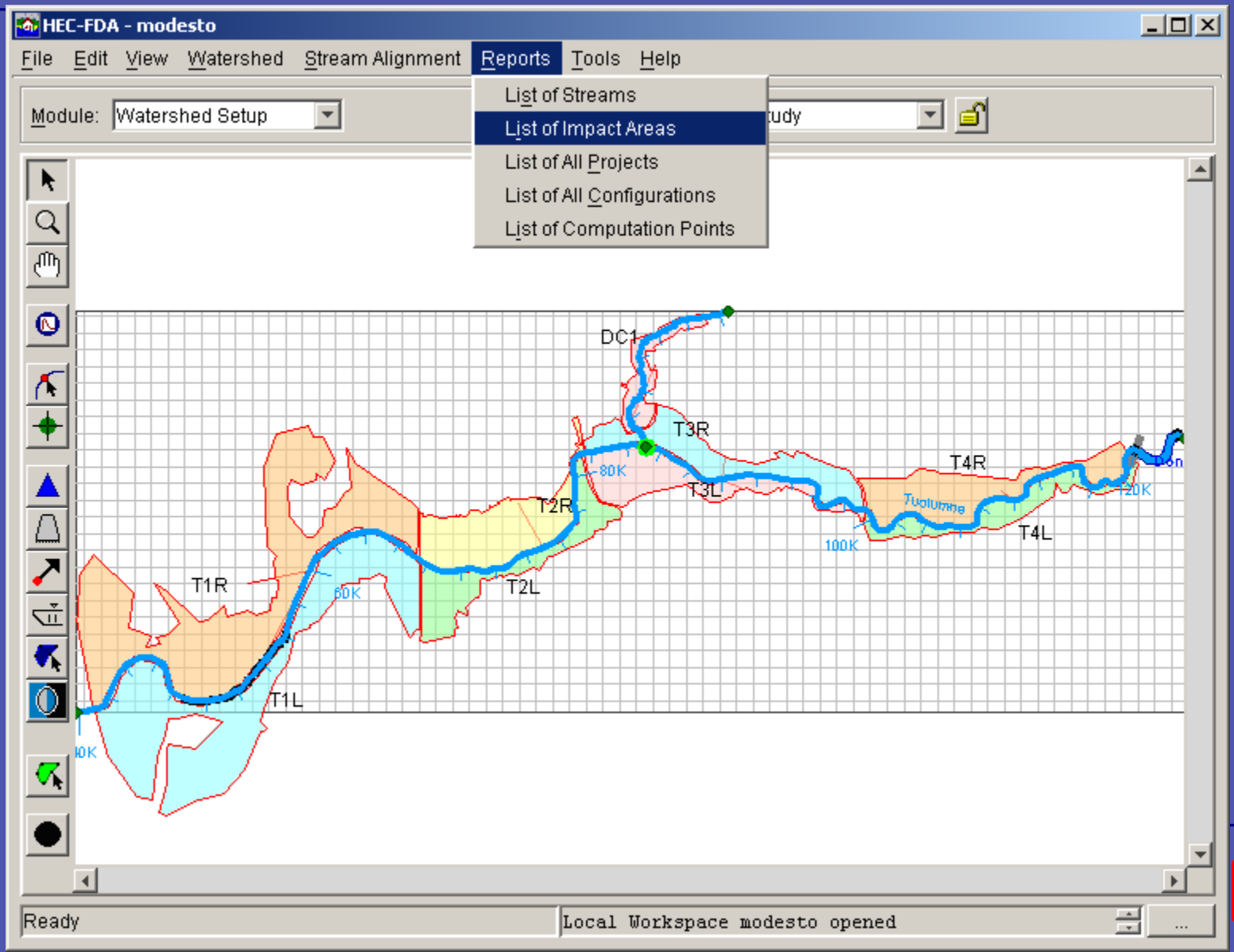
Configuration Editor



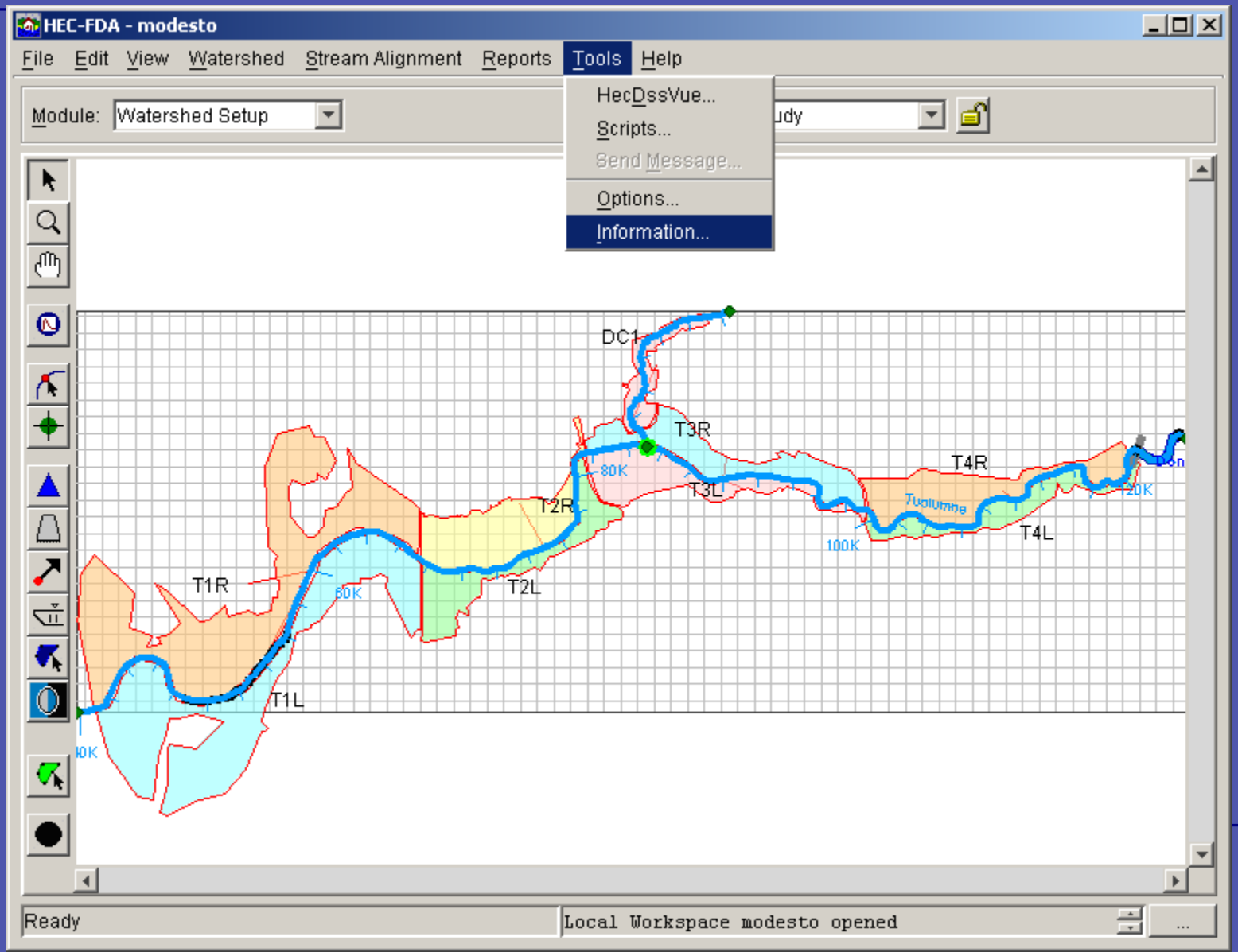
View Layers


HEC-FDA - modesto
File Edit View Watershed Stream Alignment Reports Tools Help
Zoom to All
Layers...
Unit System
Time Zone
Restore Windows
Module:
Configuration
DC1
T3R
T3L
T2R
T2L
T1R
T1L
80K
60K
Coordinates: 6413597 east, 2068181 north
Local Workspace mode
modesto - Layer Selector
Layers Edit Maps View
Layers
Time Series Icons
StreamAlignment
Study
census.shp
TerrainGrid.smrmp
500yr_InundationGrid.smrmp
5yr_InundationGrid.smrmp
250yr_InundationGrid.smrmp
100yr_InundationGrid.smrmp
50yr_InundationGrid.smrmp
25yr_InundationGrid.smrmp
10yr_InundationGrid.smrmp
2yr_InundationGrid.smrmp
modesto.netbin
inundation_grids.ifg
xscutlines.shp
damage_rch.shp
stream.shp
OK
Apply
Cancel

Reports (Watershed Setup)



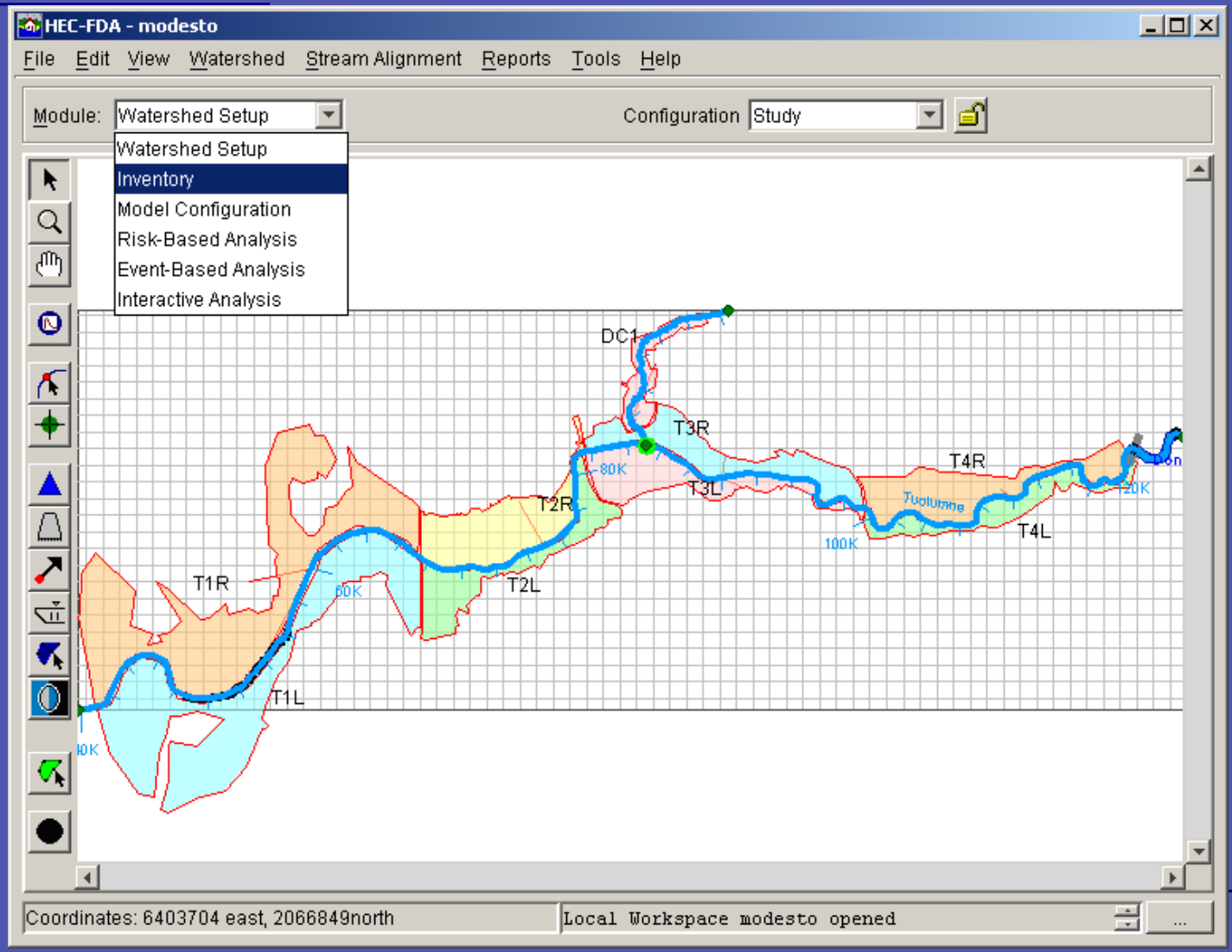
Tools


HEC-FDA - modesto
File Edit View Watershed Stream Alignment Reports Tools Help
HecDssVue...
Scripts...
Send Message...
Options...
Information...
Module: Watershed Setup
DC1
T3R
T4R
T3L
T2R
T4L
T1R
T2L
T1L
80K
60K
100K
20K
Tuolumne
Ready
Local Workspace modesto opened

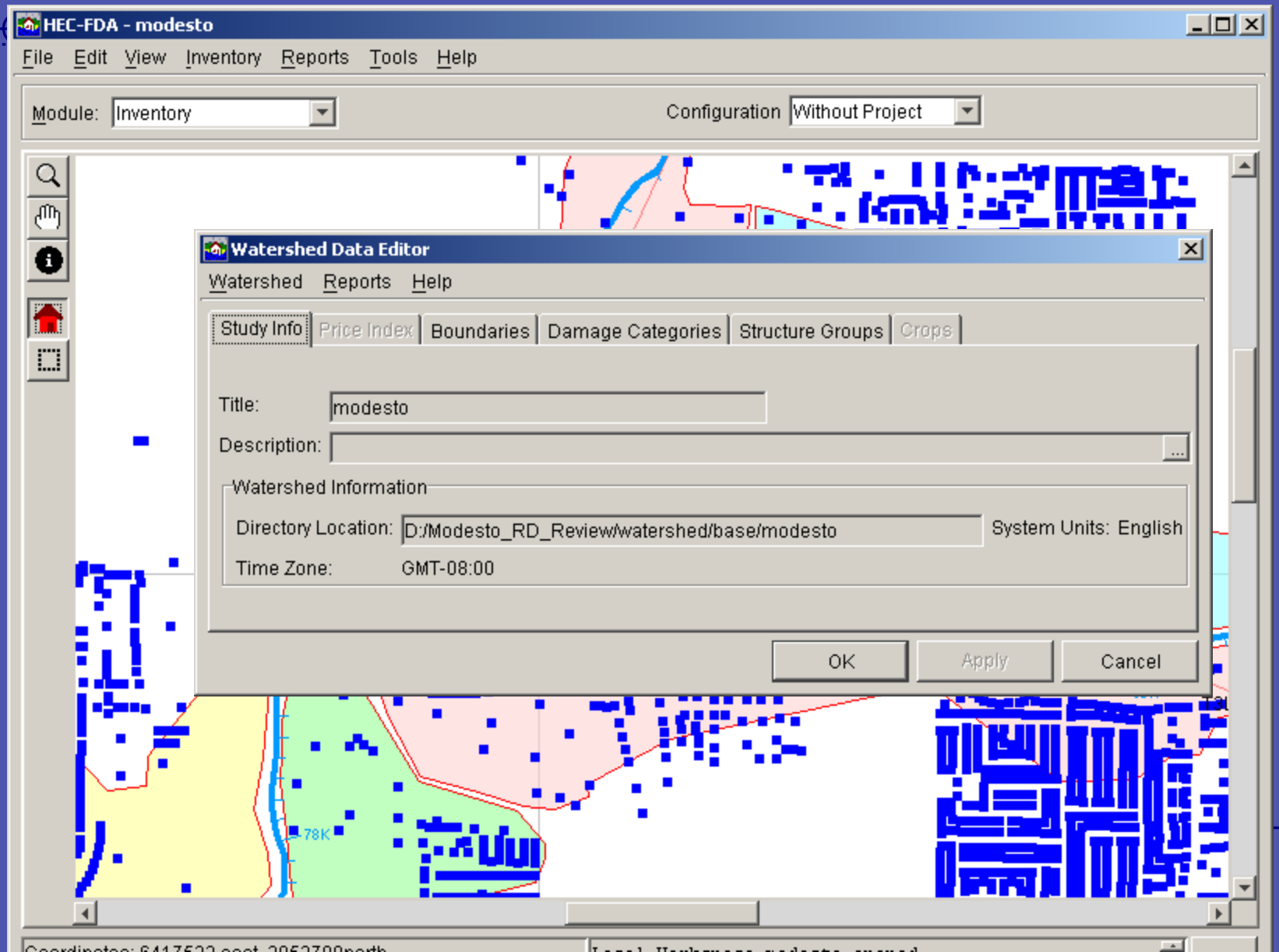
Inventory Module

- Watershed Data
- Structure Occupancy Types (depth - % damage or depth – damage functions)
- Structures
  - Creating, editing
  - Moving, grouping

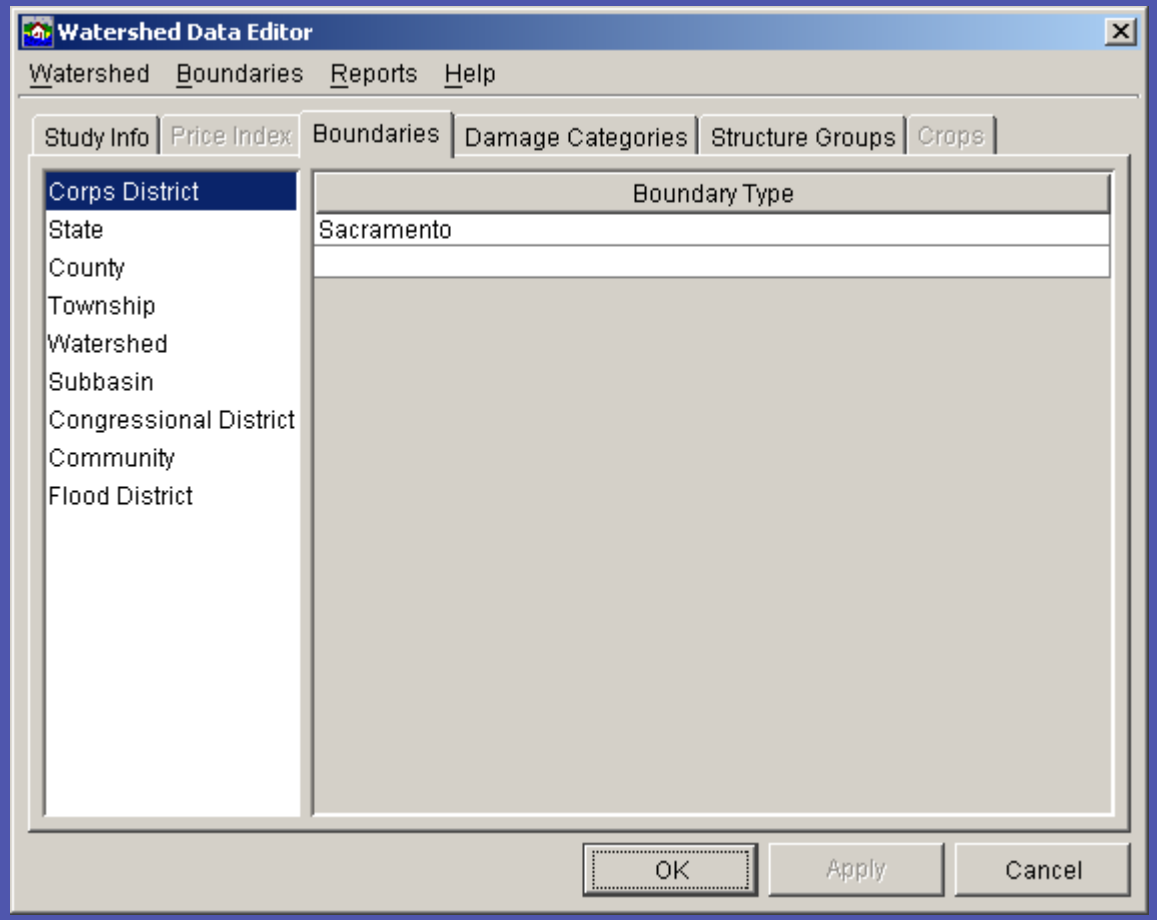
Inventory Module



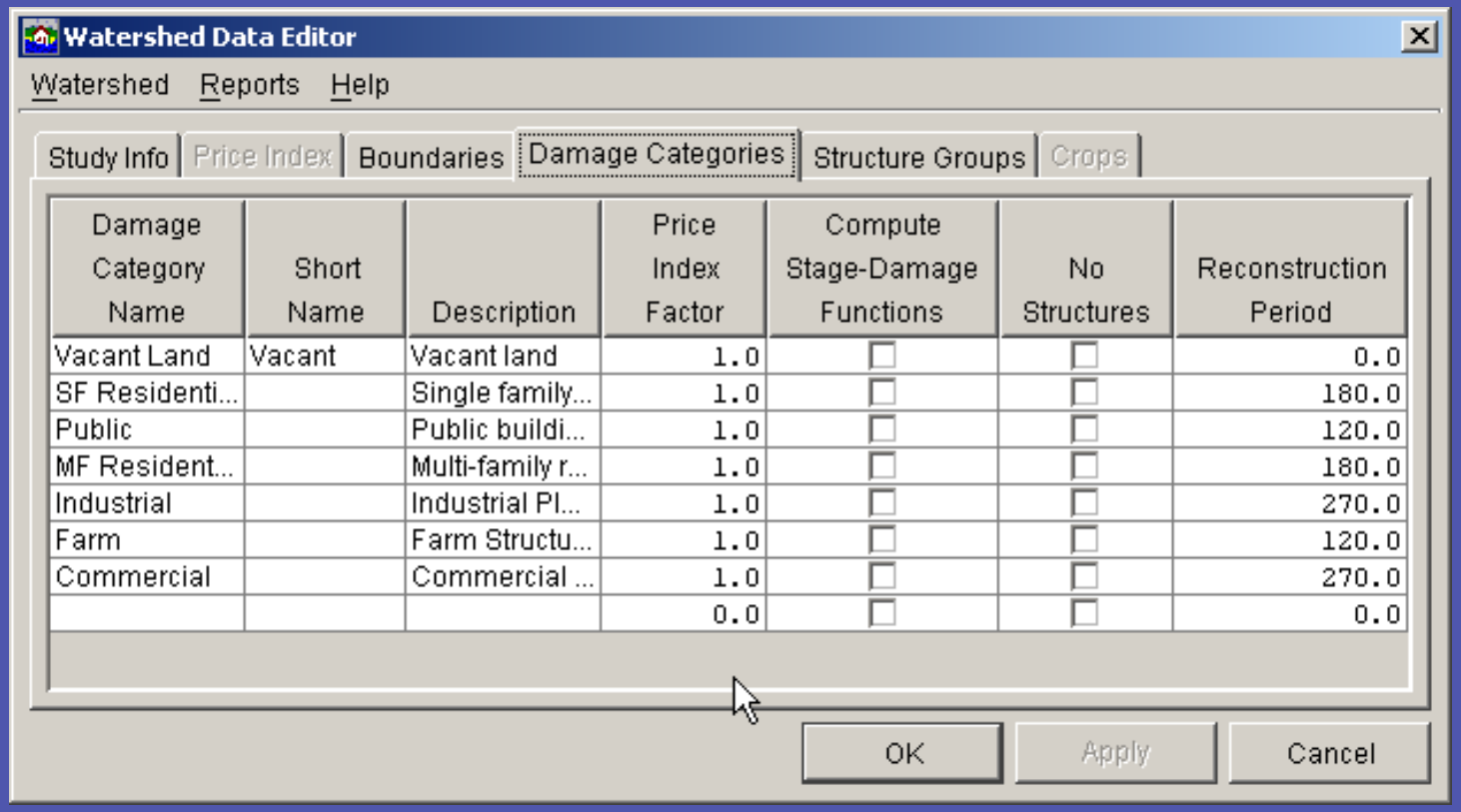
Watershed Data Editor – Inventory Module



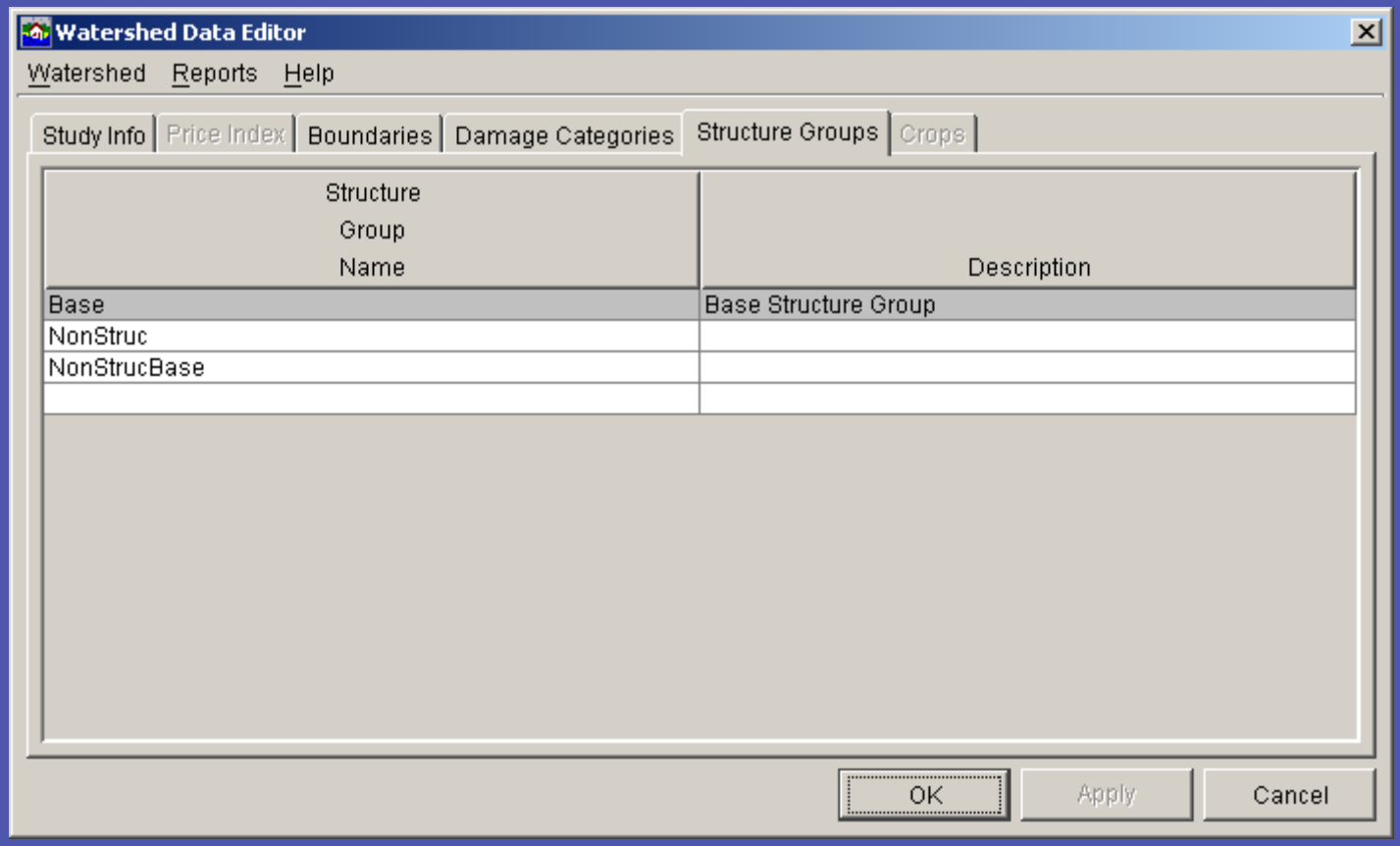
Boundaries


Watershed Data Editor
Watershed
Boundaries
Reports
Help
Study Info
Price Index
Boundaries
Damage Categories
Structure Groups
Crops
Corps District
State
County
Township
Watershed
Subbasin
Congressional District
Community
Flood District
Boundary Type
Sacramento
OK
Apply
Cancel

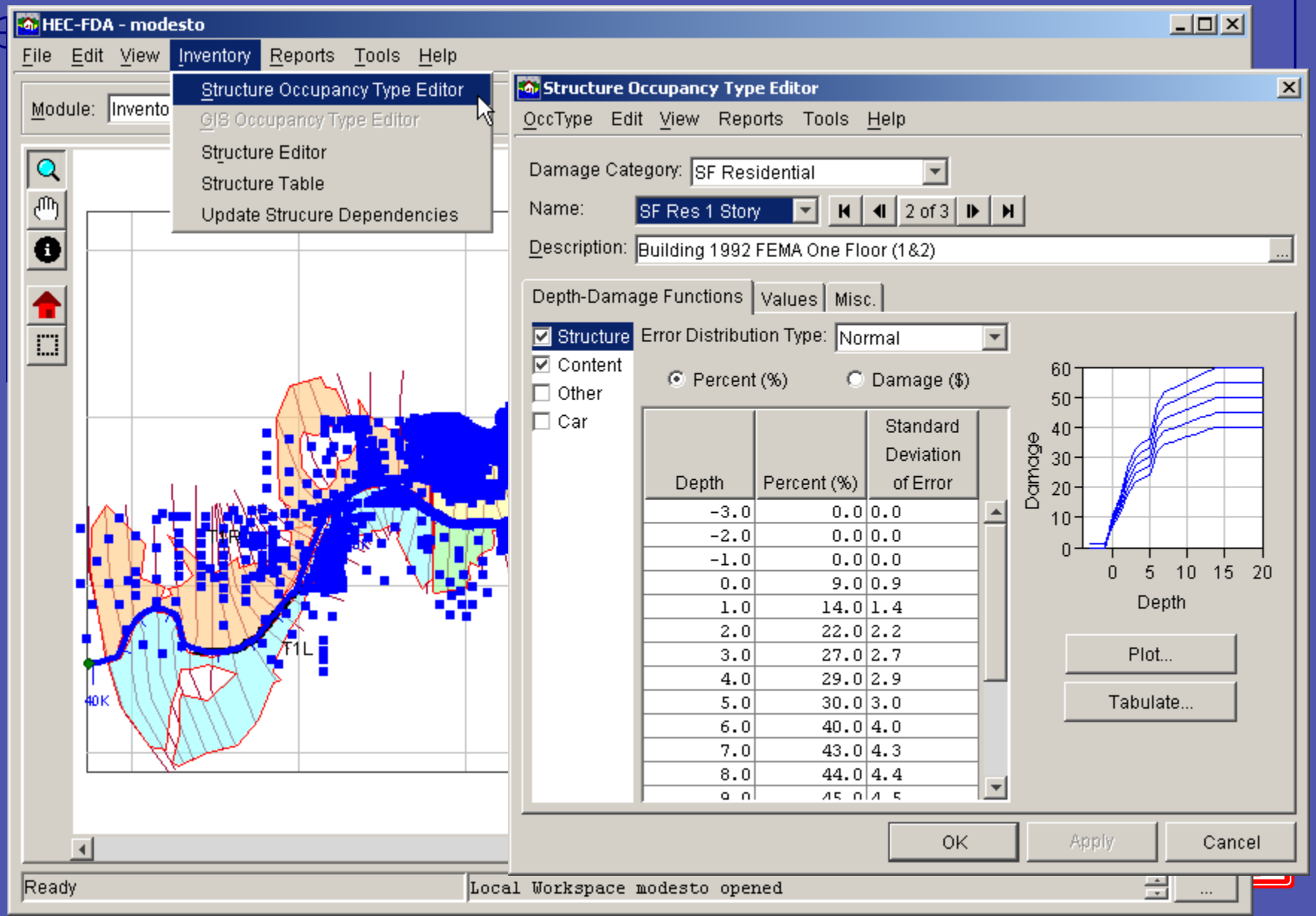
Damage Categories



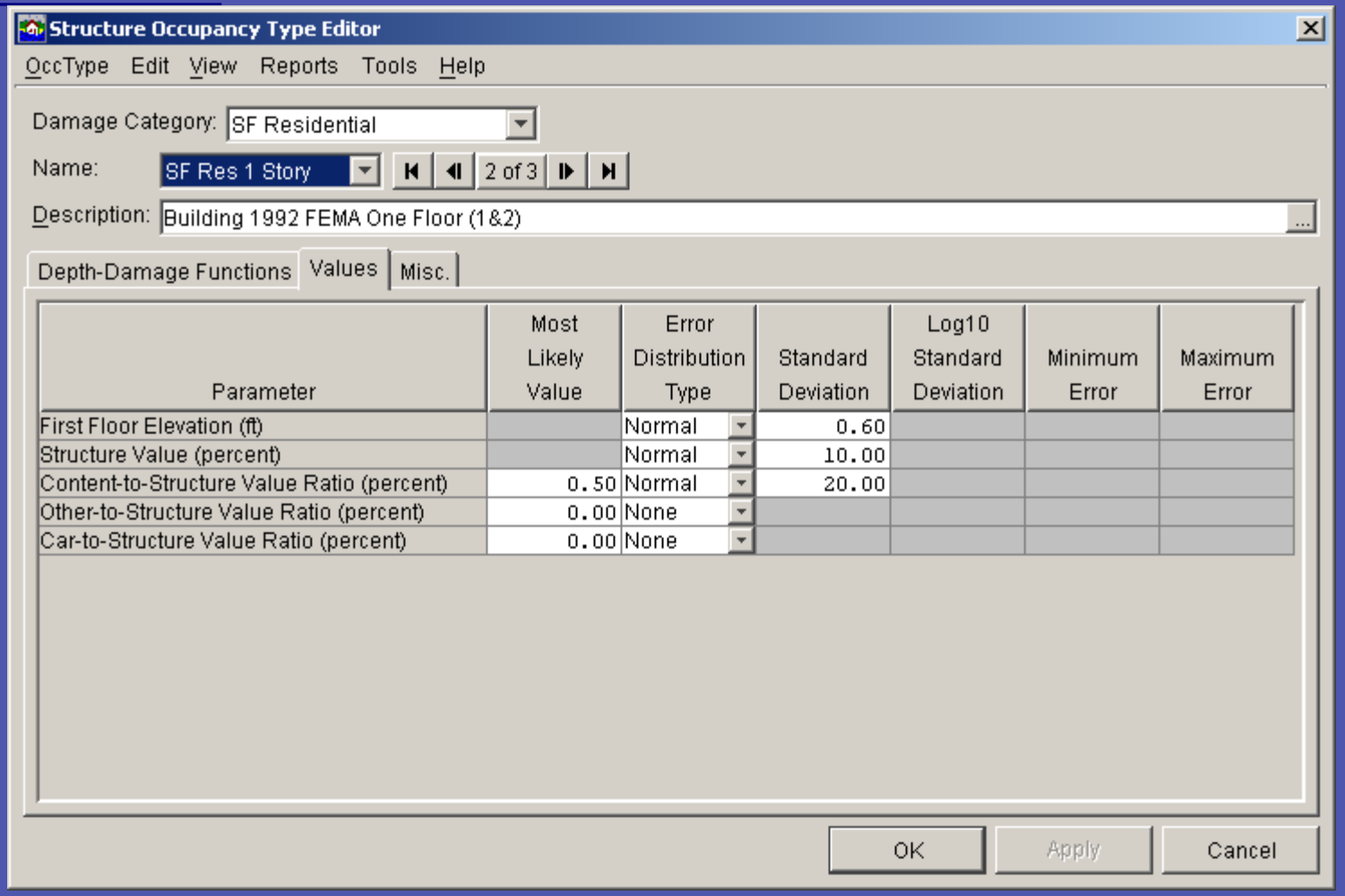
Structure Groups *(old Structure Modules)*



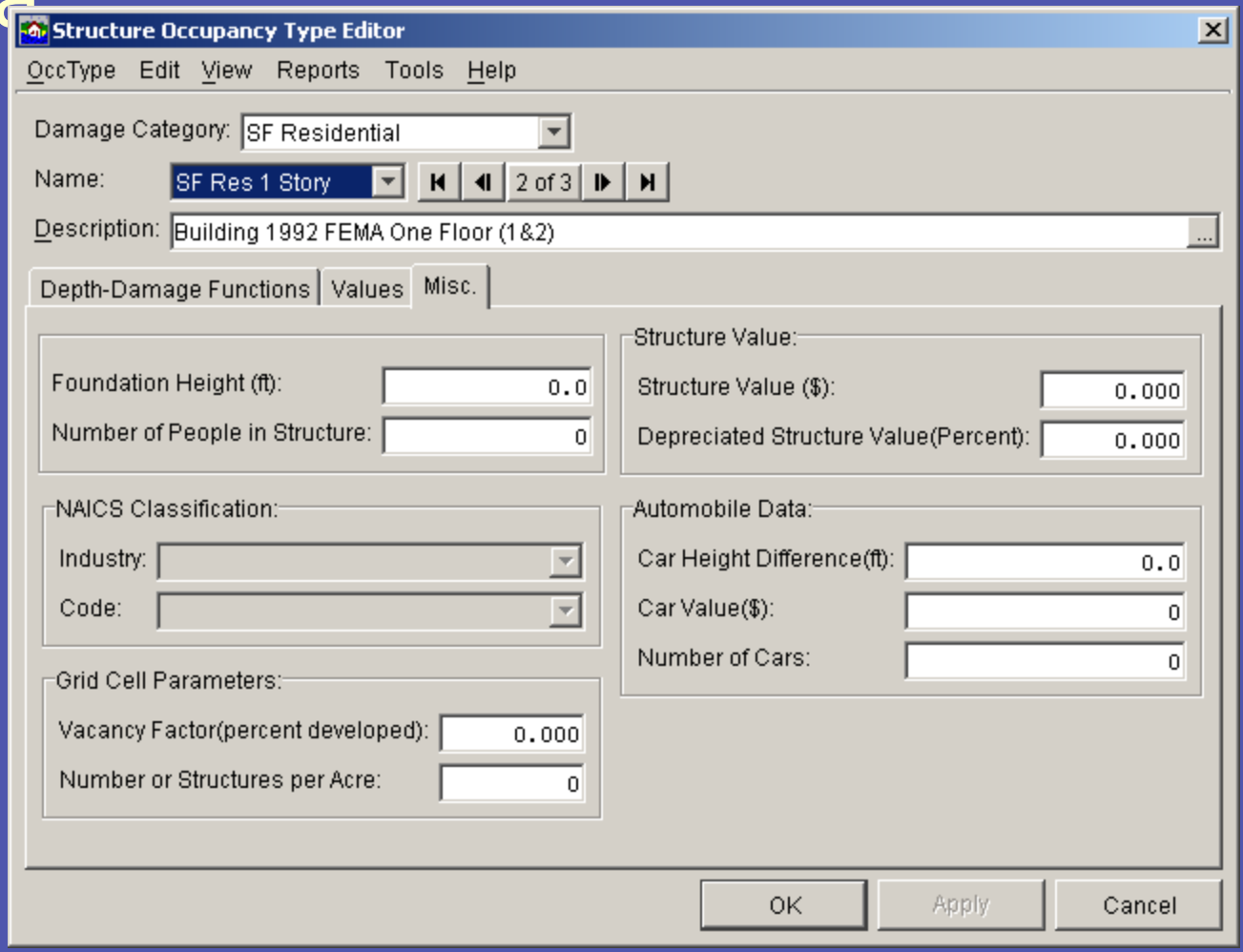
Occupancy Type Editor



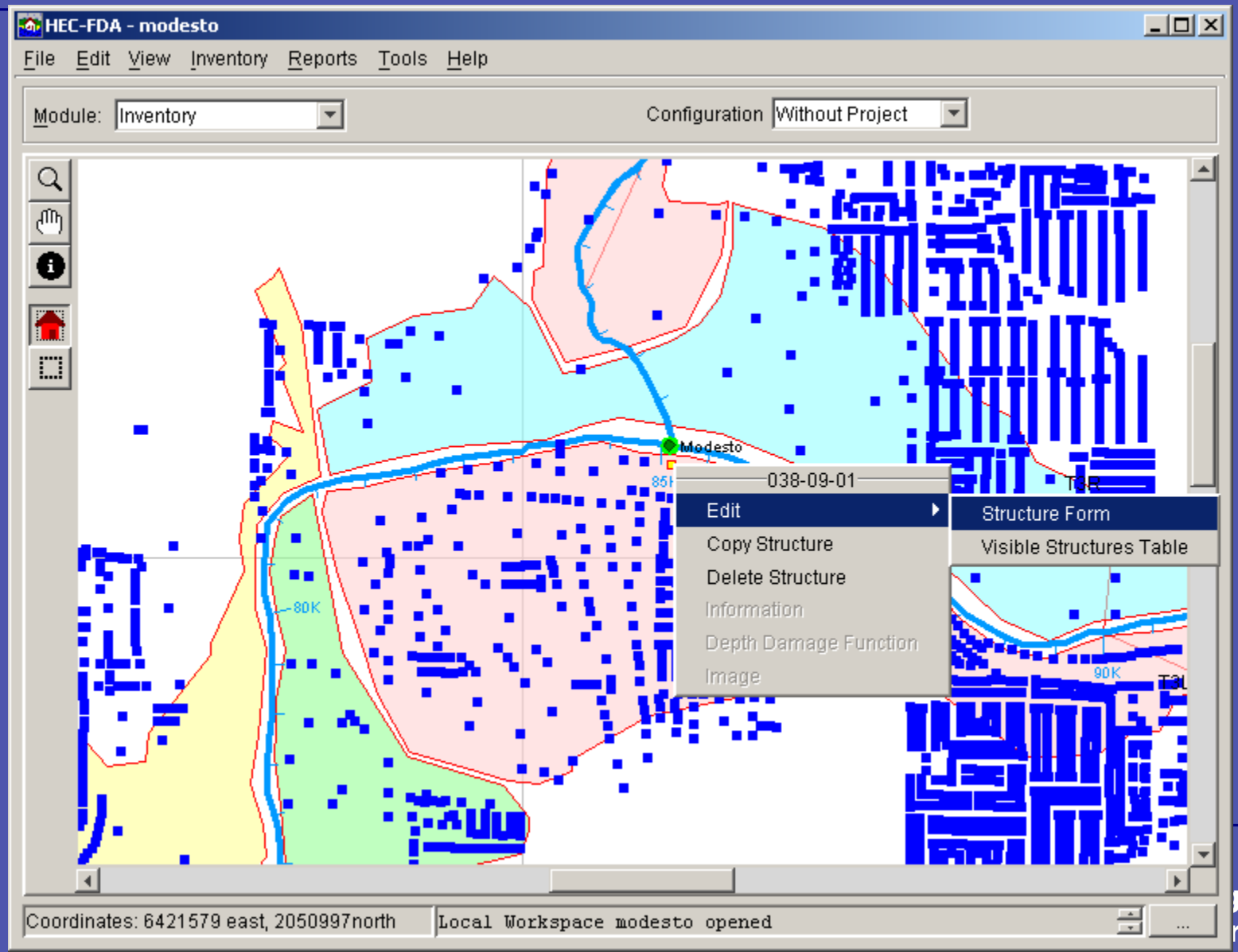
Occupancy Type - Values


Structure Occupancy Type Editor
OccType Edit View Reports Tools Help
Damage Category: SF Residential
Name: SF Res 1 Story 2 of 3
Description: Building 1992 FEMA One Floor (1&2)
Depth-Damage Functions Values Misc.
Parameter | Most Likely Value | Error Distribution Type | Standard Deviation | Log10 Standard Deviation | Minimum Error | Maximum Error
First Floor Elevation (ft) | | Normal | 0.60 | | | |
Structure Value (percent) | | Normal | 10.00 | | | |
Content-to-Structure Value Ratio (percent) | 0.50 | Normal | 20.00 | | | |
Other-to-Structure Value Ratio (percent) | 0.00 | None | | | | |
Car-to-Structure Value Ratio (percent) | 0.00 | None | | | | |
OK
Apply
Cancel

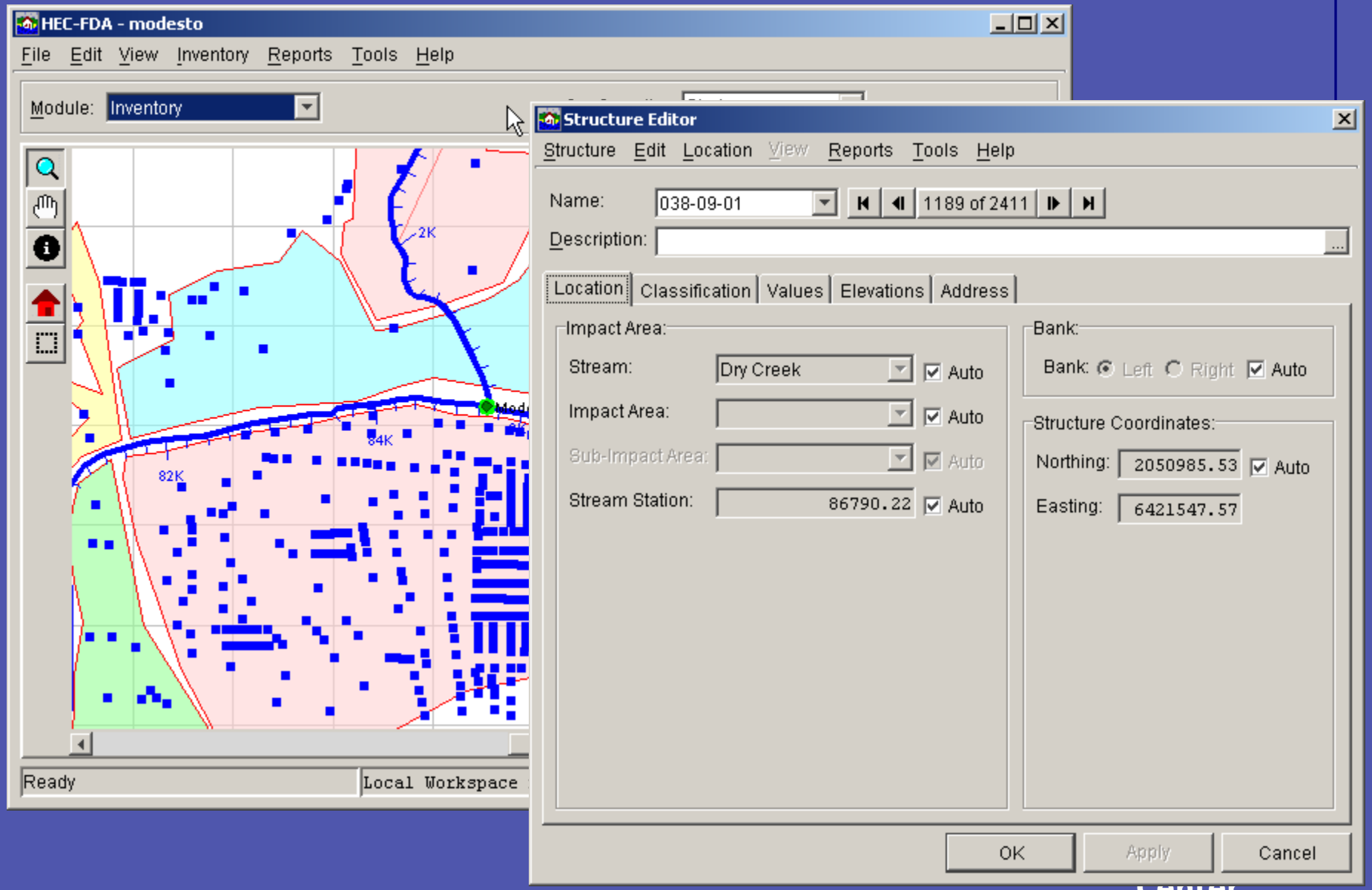
Occupancy Types – Miscellaneous Data



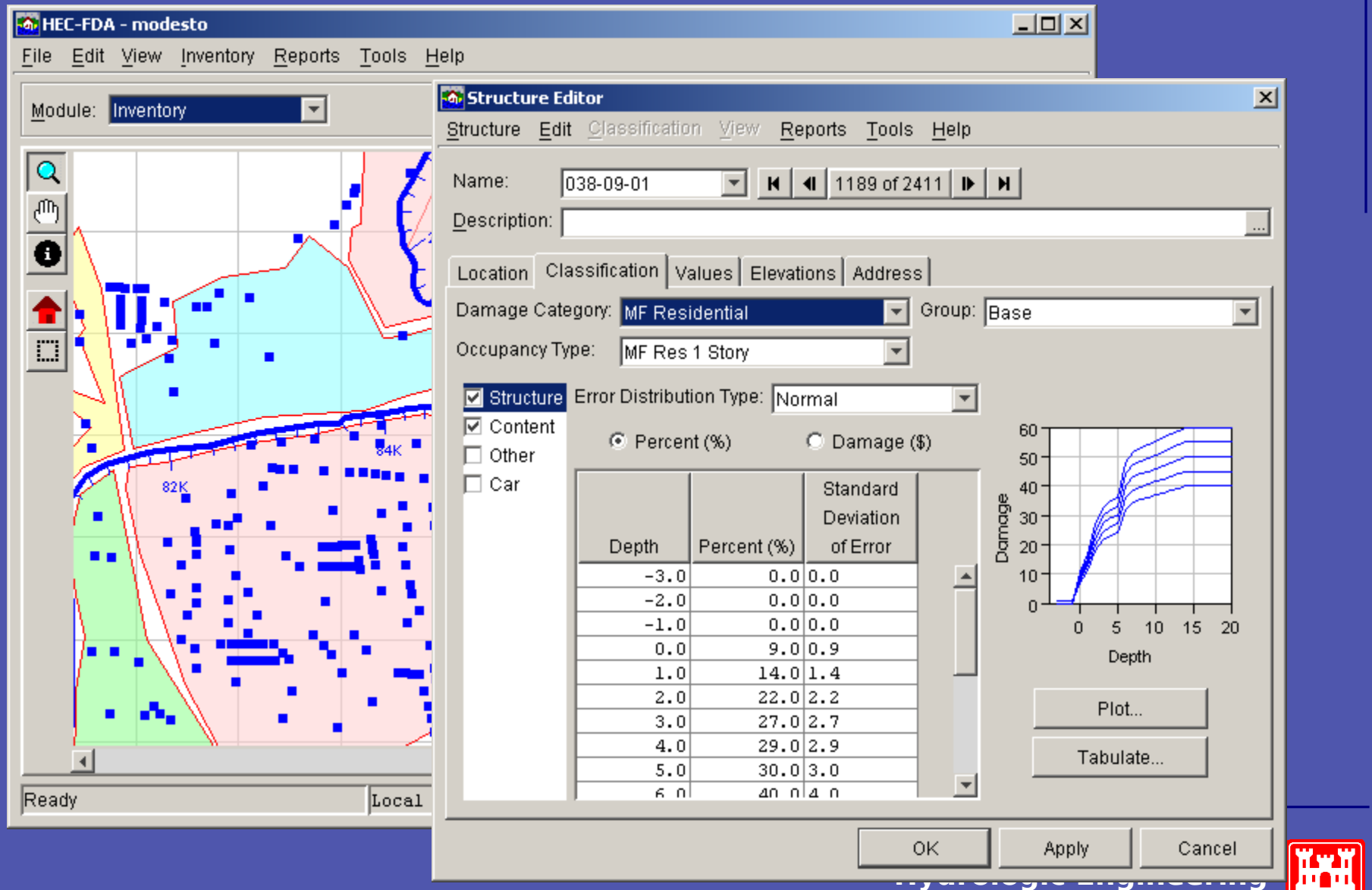
Edit Structure



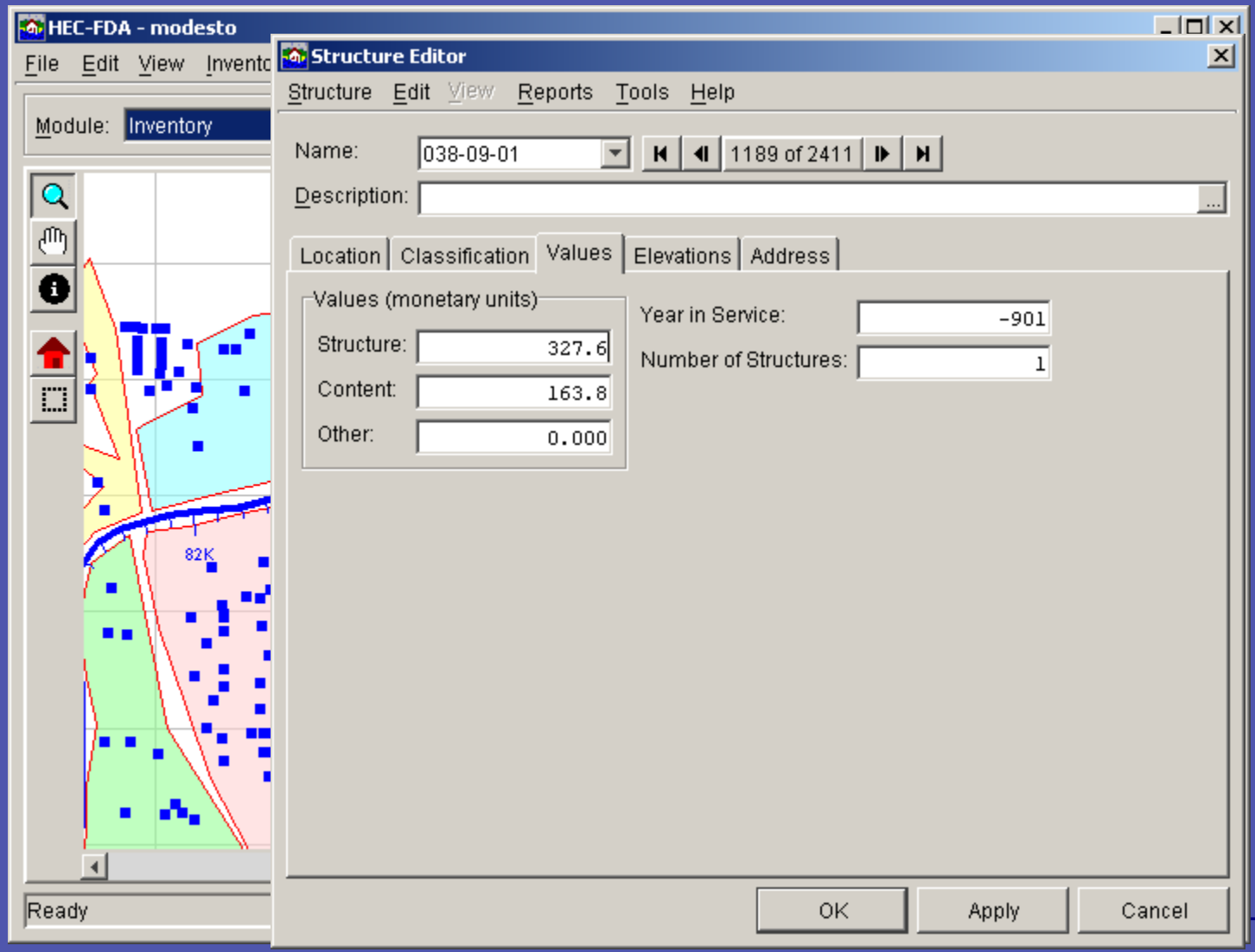
Structure Location



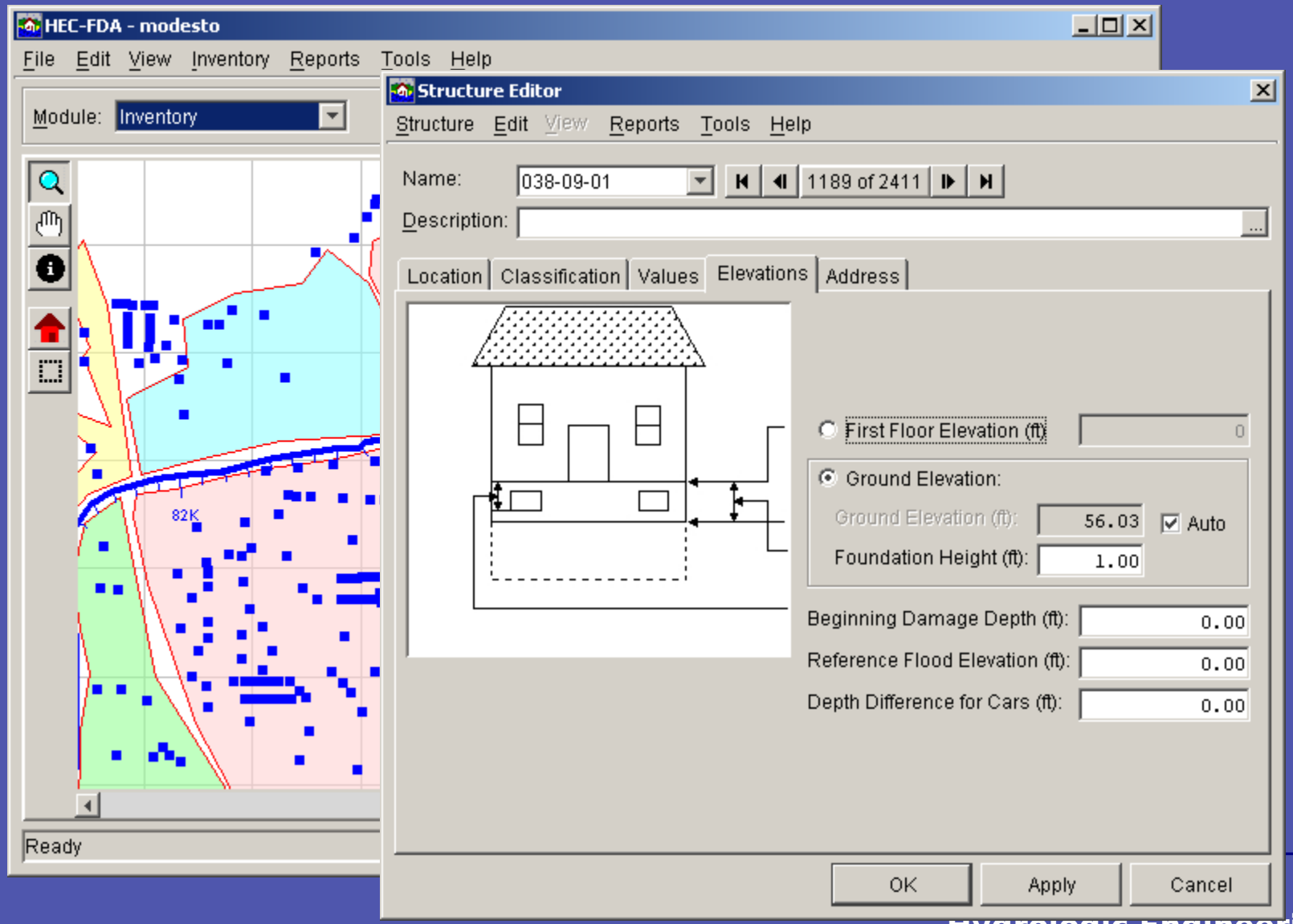
Structure Classification



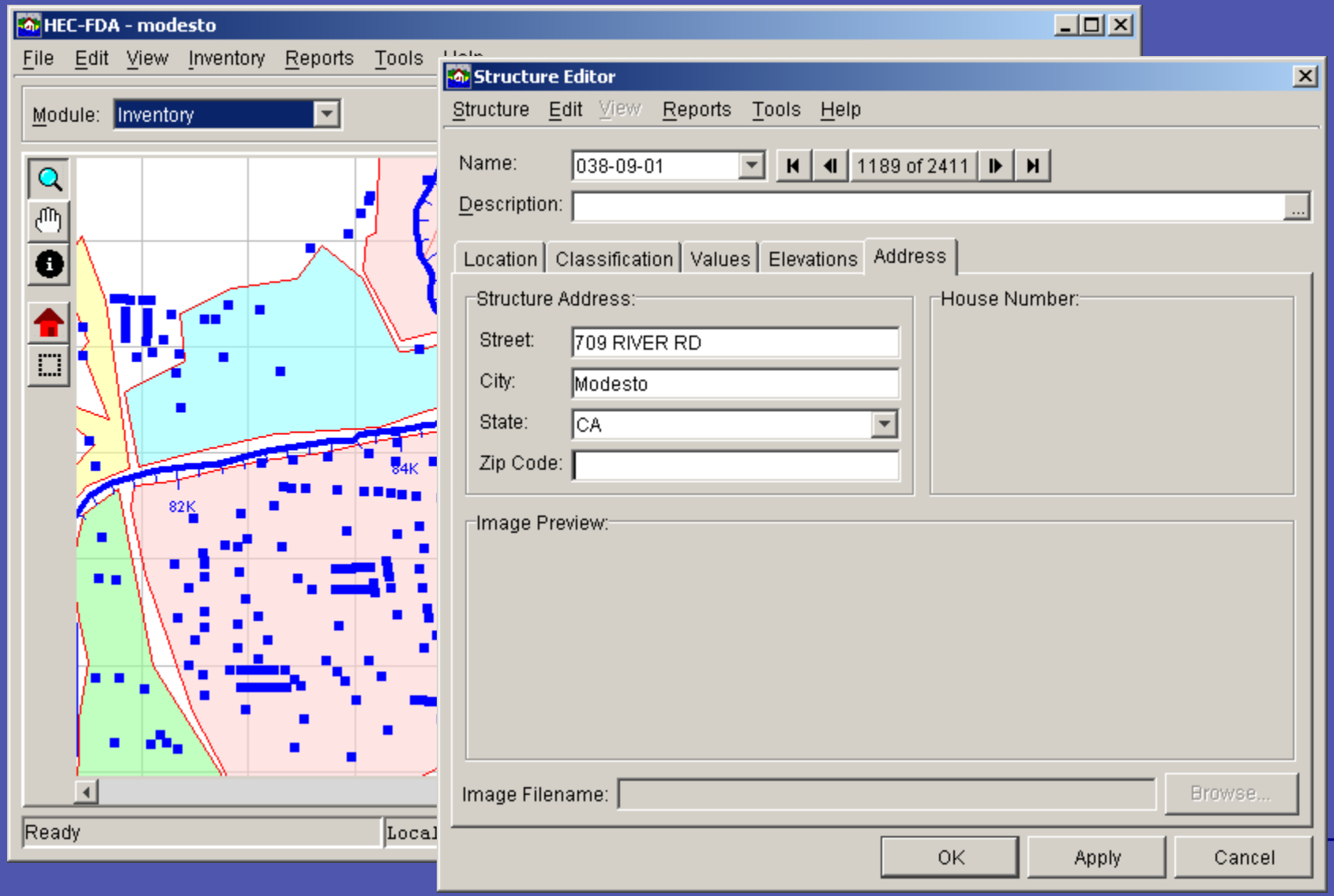
Structure Values



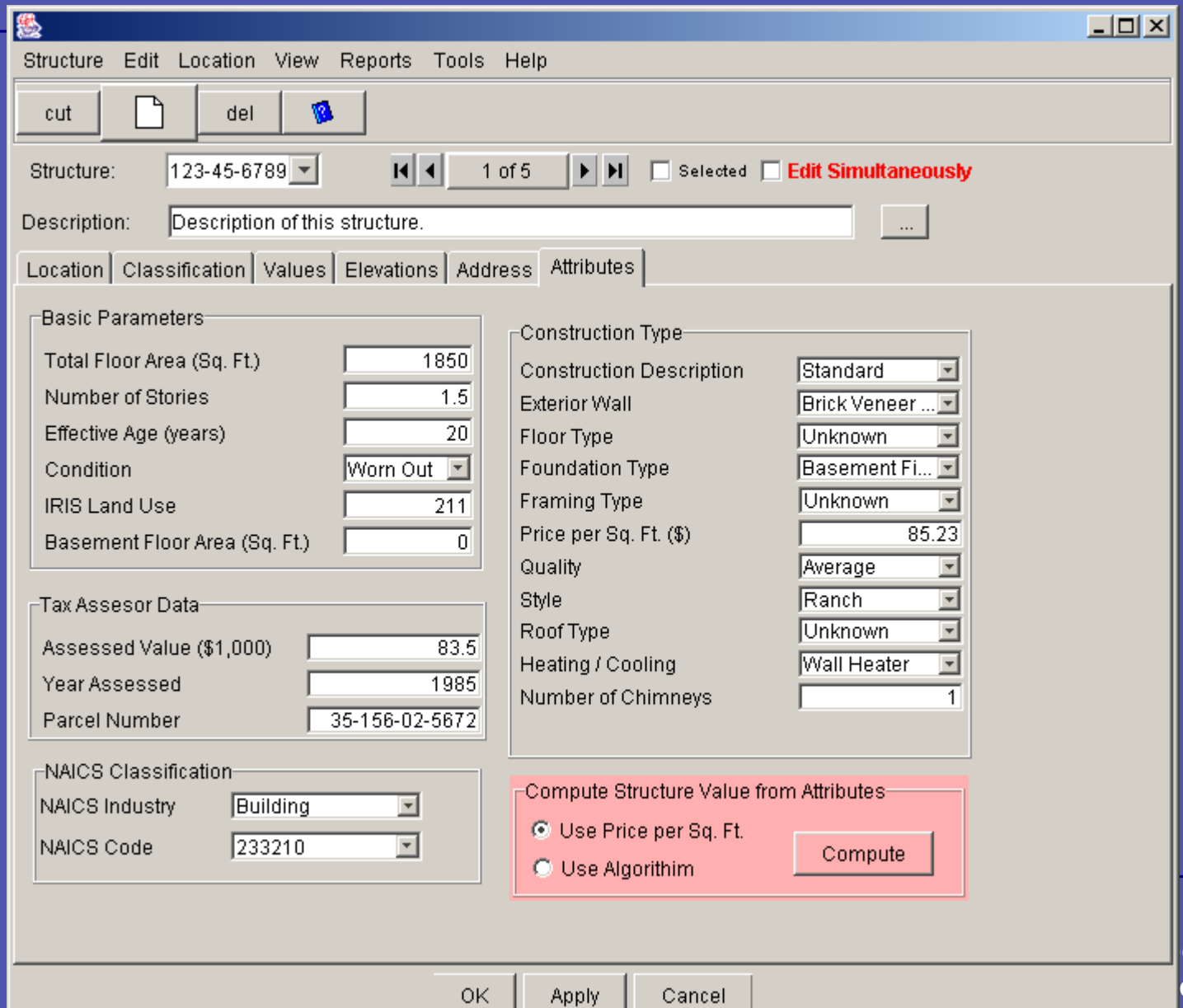
Structure Elevations



Structure Address

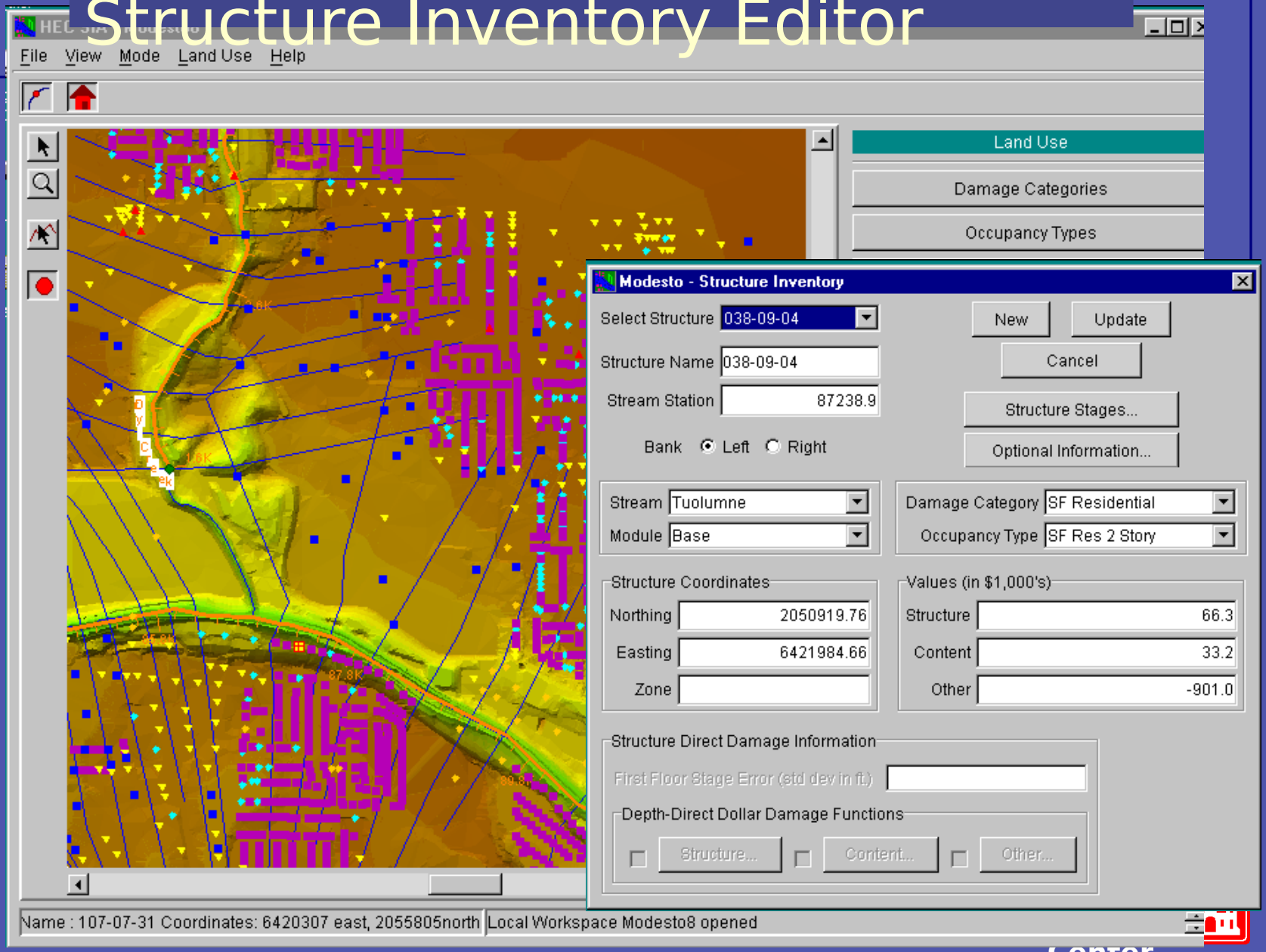


Structure Attributes



ering
enter

Structure Inventory Editor

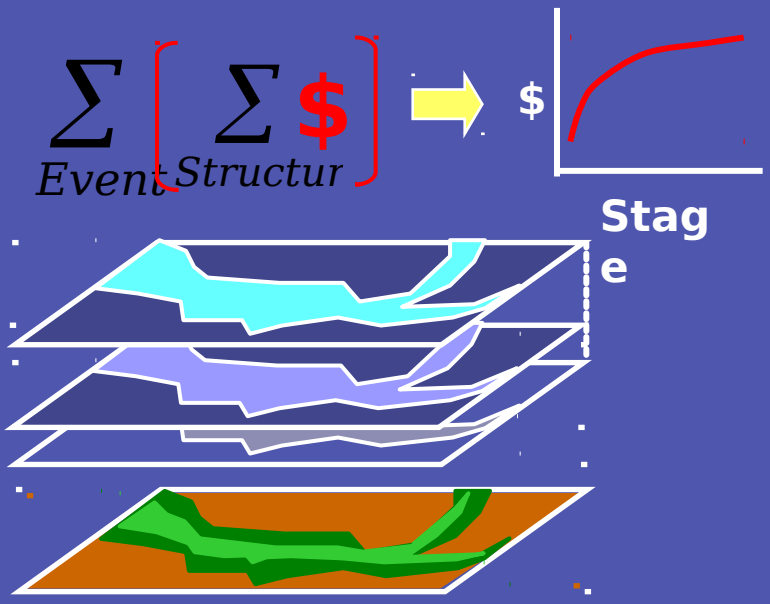


Model Configuration Module

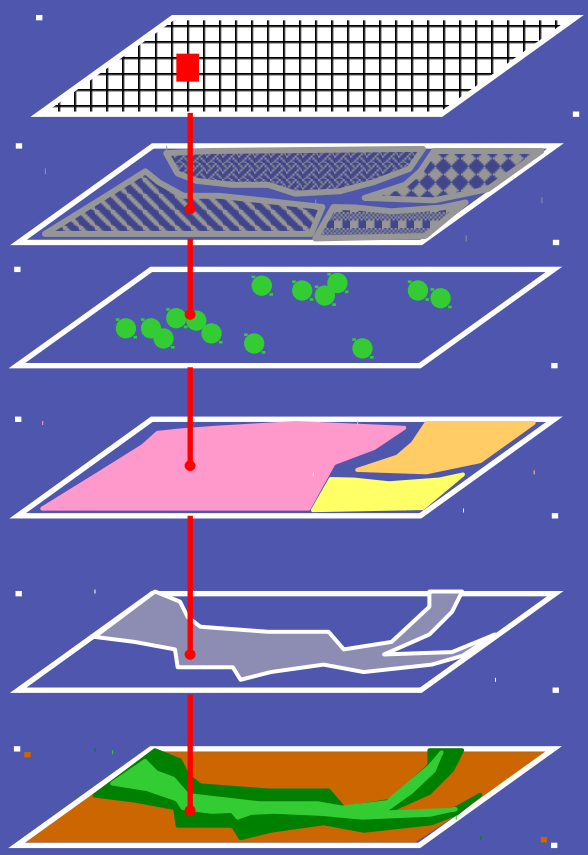
- Impact Area Information
  - Enter existing stage-damage curves, agricultural elevation-area curves
  - Discharge exceedance probability curves, rating curves with uncertainty
  - Water surface profiles
  - Flood inundation maps
- Stage-Damage Calculations
  - Unique Structure Inventory
  - Grid Cell Analysis

Model Configuration Module

- Creating stage-damage for all events with uncertainty
  - Structure Inventory
  - Census block or land use
  - Structures & population
  - Multiple water surface profiles or flood inundation maps.



Model Configuration Module



Grid Layout

Impact Area

Structure = APN11897

Struct. Occ. Type = SSNOB

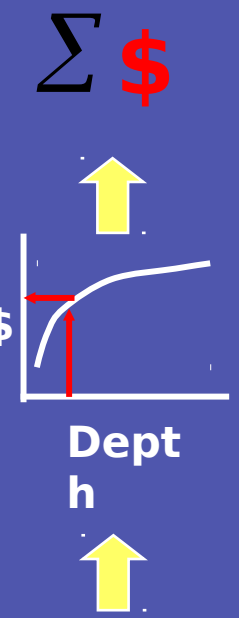
Damage Cat. = Residential

Agricultural = Corn

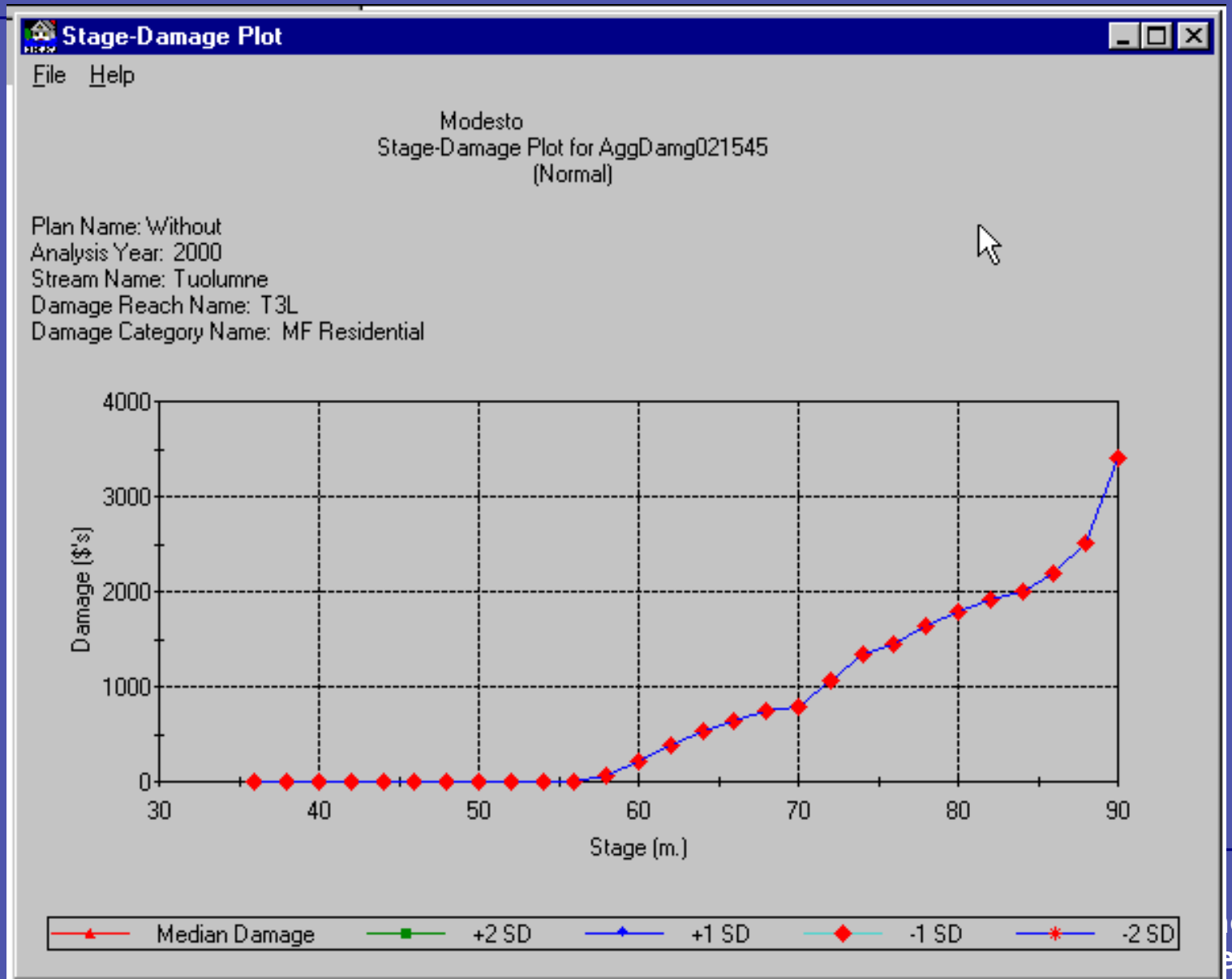
Water Elevation = 1,024 ft

Ground Elevation = 1,020 ft

Depth = 4 ft



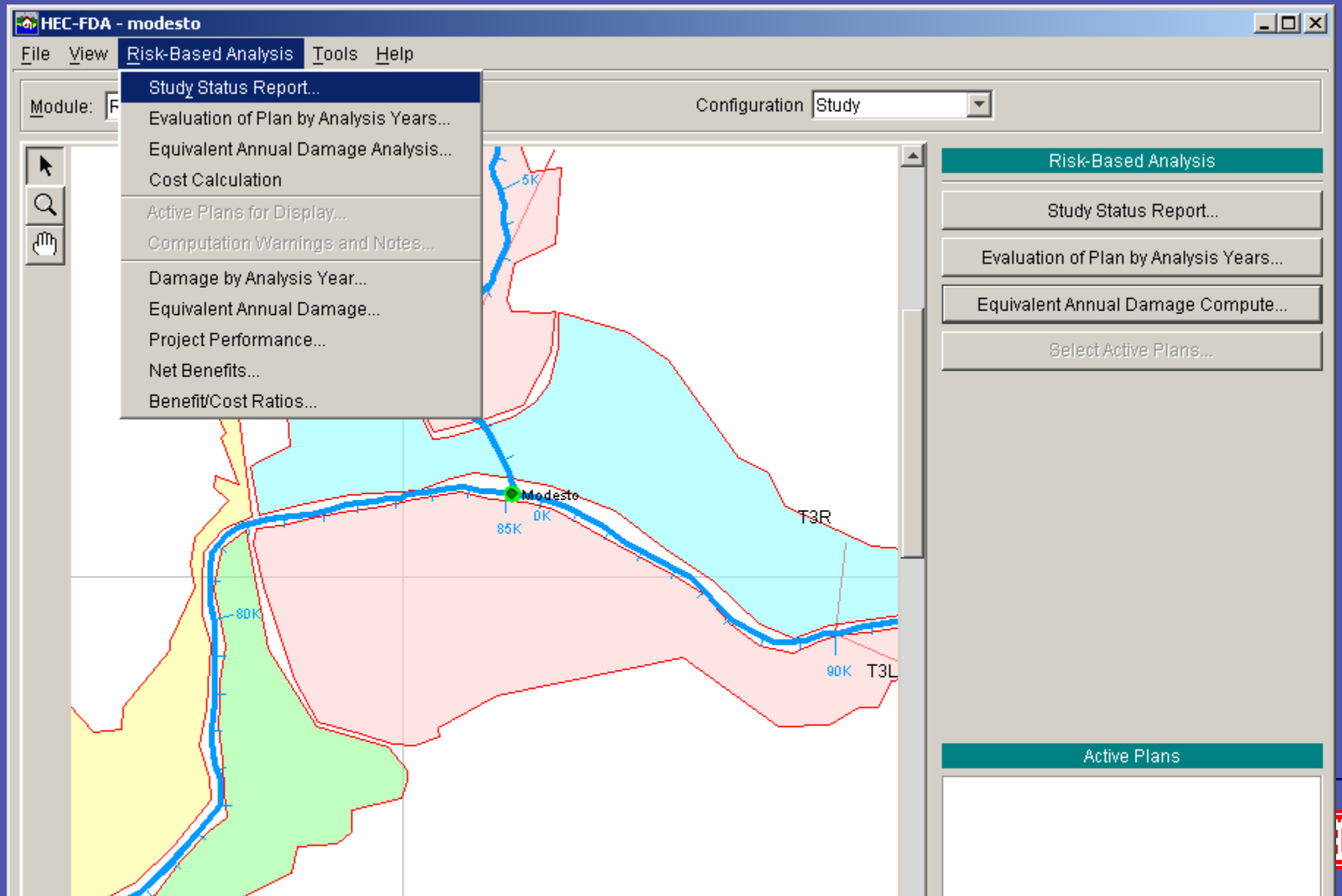
Stage-Aggregated Damage



Risk Analysis Module

- Helps answer the question “Which proposed flood damage reduction plan is the best from an economic standpoint?”
  - Evaluate the without condition
  - Analyze alternative damage reduction plans
- Compare plans using Expected Annual Damage and damage reduction benefits
- Use risk analysis procedures
- Cost Benefit Analysis (new capability)
- Structures and Population w/ uncertainty (new capability)

Risk-Based Analysis Module



Risk Analysis Module

Expected Annual Damage Results

Plan Name	Plan Description	APT	AUTO	COMM	PUB	RES	Total Damage
Without	Without project condition	636	140	105	0	74	955
Plan 1	Detention + Channel Imp.	421	4	10	0	58	493
Plan 2	Floodwall Only	276	139	121	0	35	571
Plan 3	Detention, Channel Imp., and Floodwall	61	3	12	0	12	88

Cost, NED

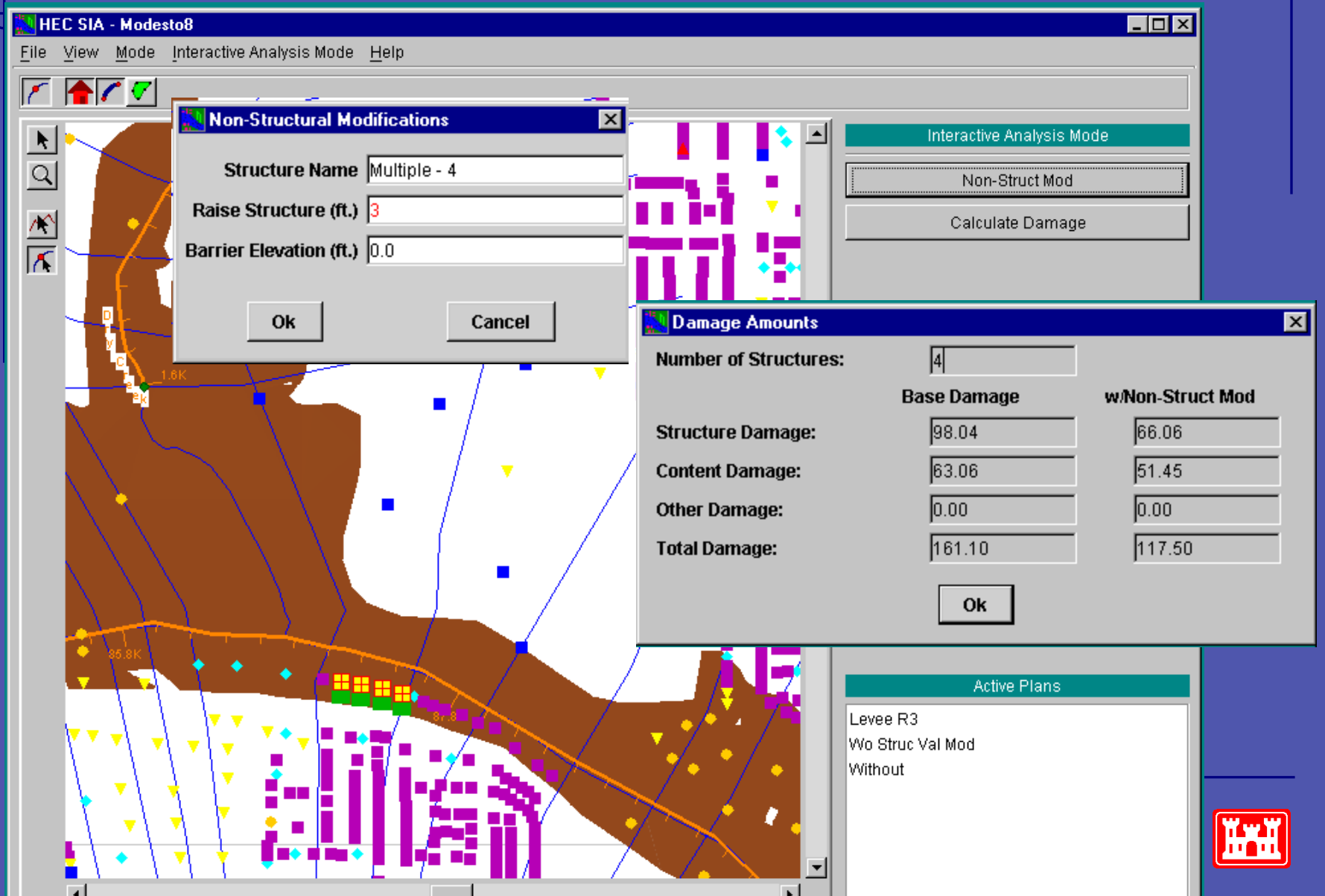
Event Analysis Module (HEC-FIA Version 1.0)

- Post Flood/Forecasted Flood Damage Assessments
- Urban & Agricultural Damage, # of Structures & Population
- Real Time Maintenance and Response Activities
- Benefits of Reservoirs and Levees
- Declaration of Disaster Areas

Interactive Analysis Module

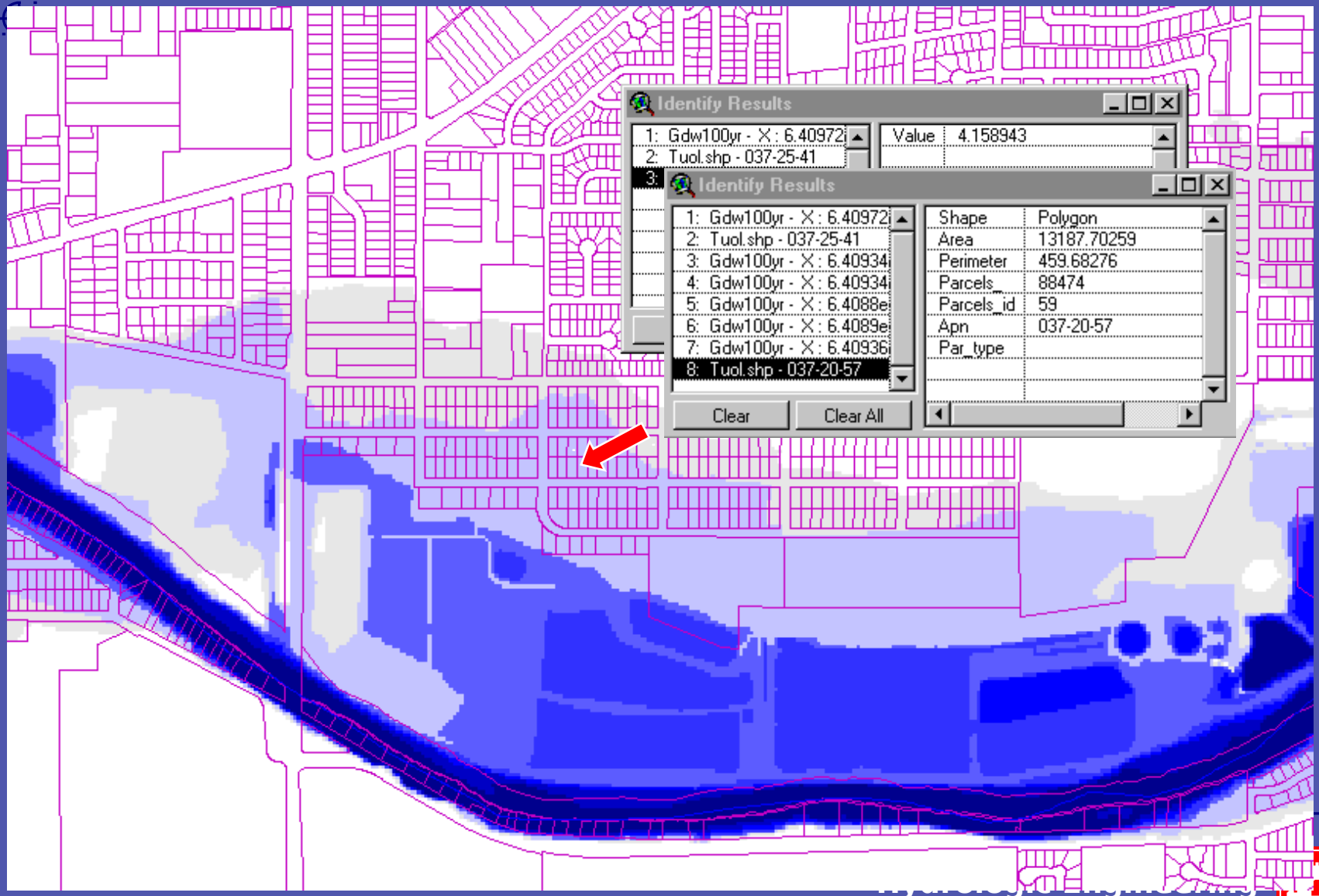
- View the Data from GIS Layers
- Edit non-structural parameters for individual structures.
- Perform Analyses Interactively
  - Structural
  - Non-structural
- Data/Results can be Grouped and Displayed
  - Damage Categories
  - Structure Values
- Review Results

Non-Structural Analysis

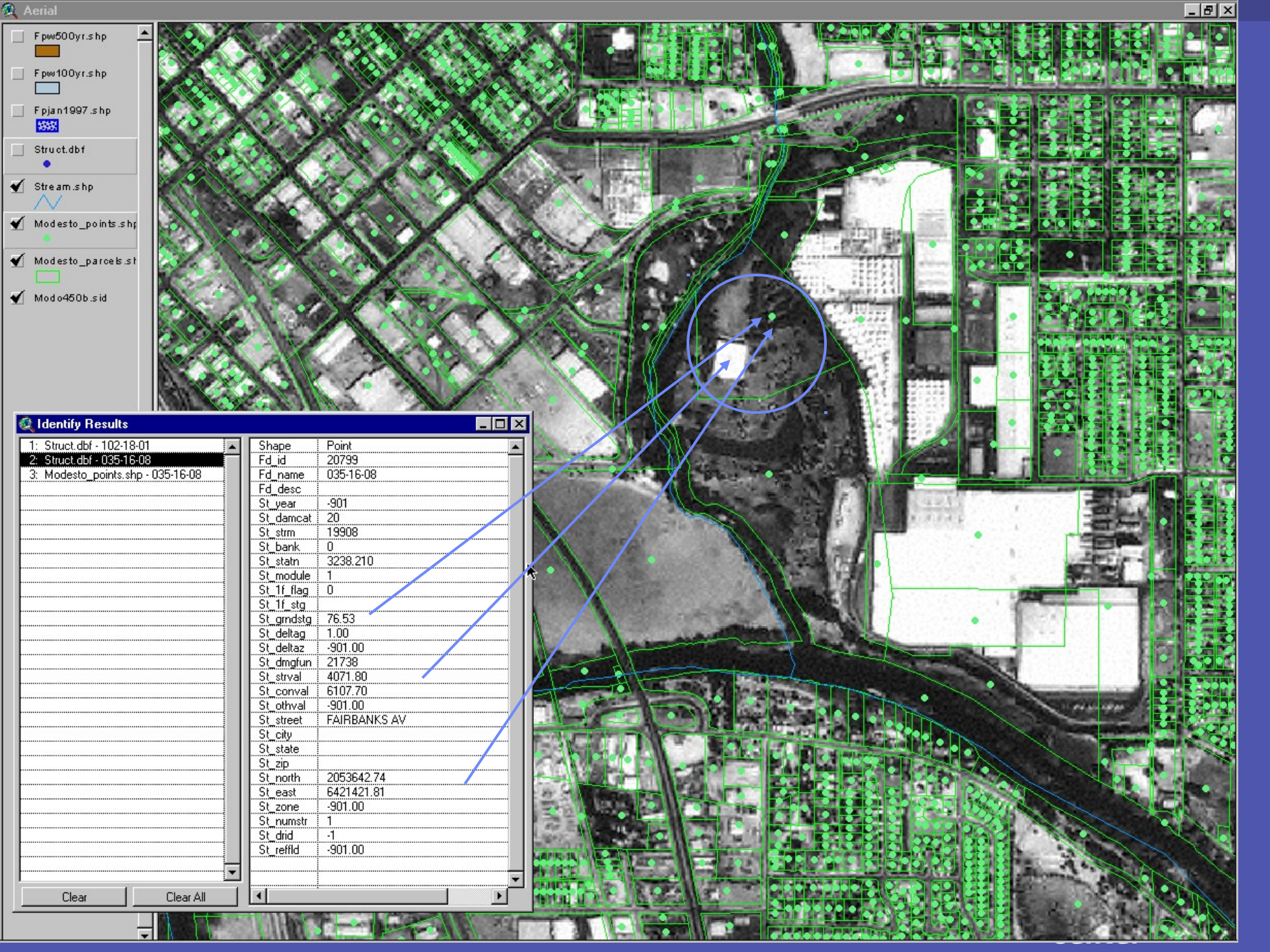


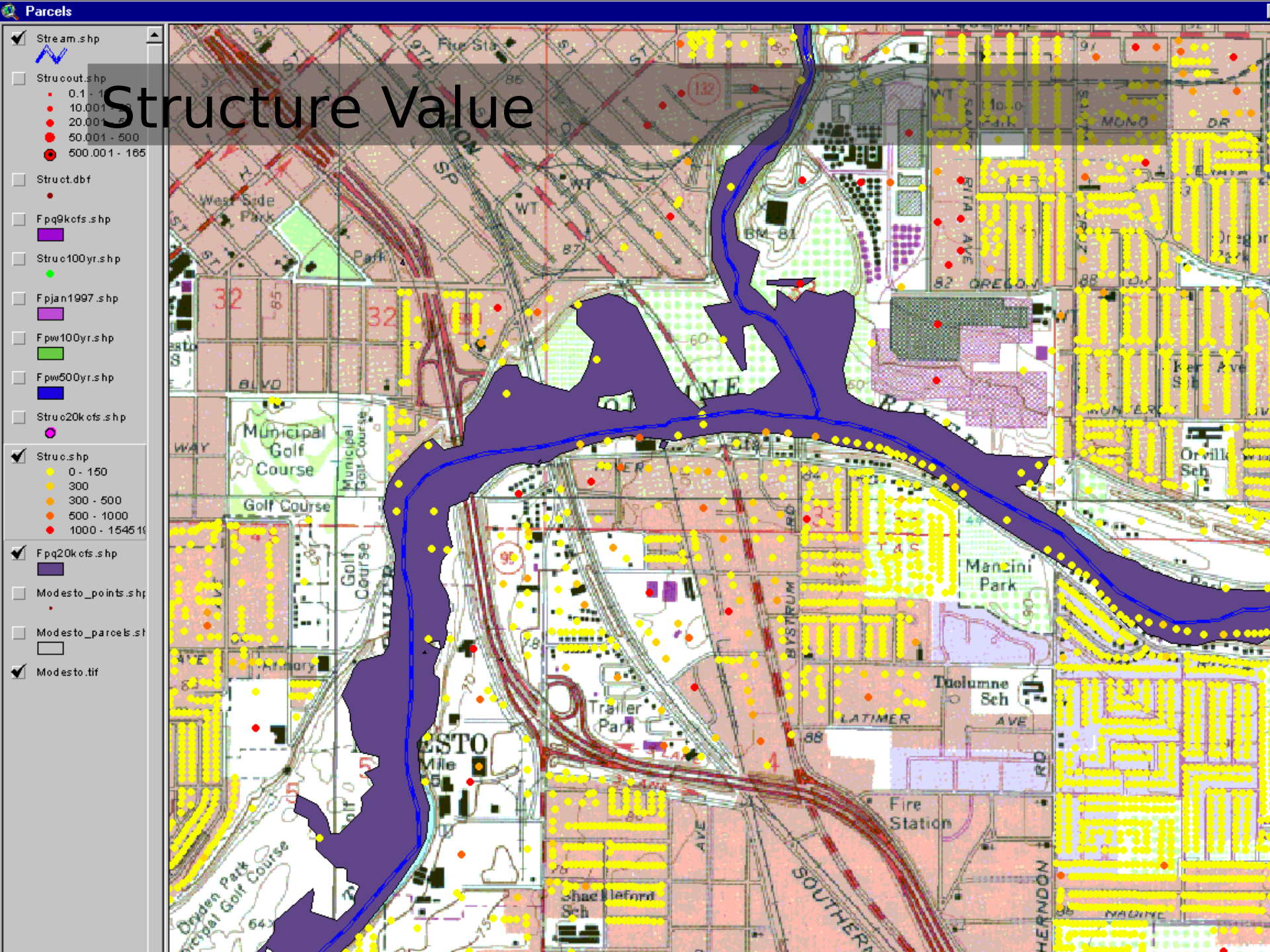
Inundation Mapping

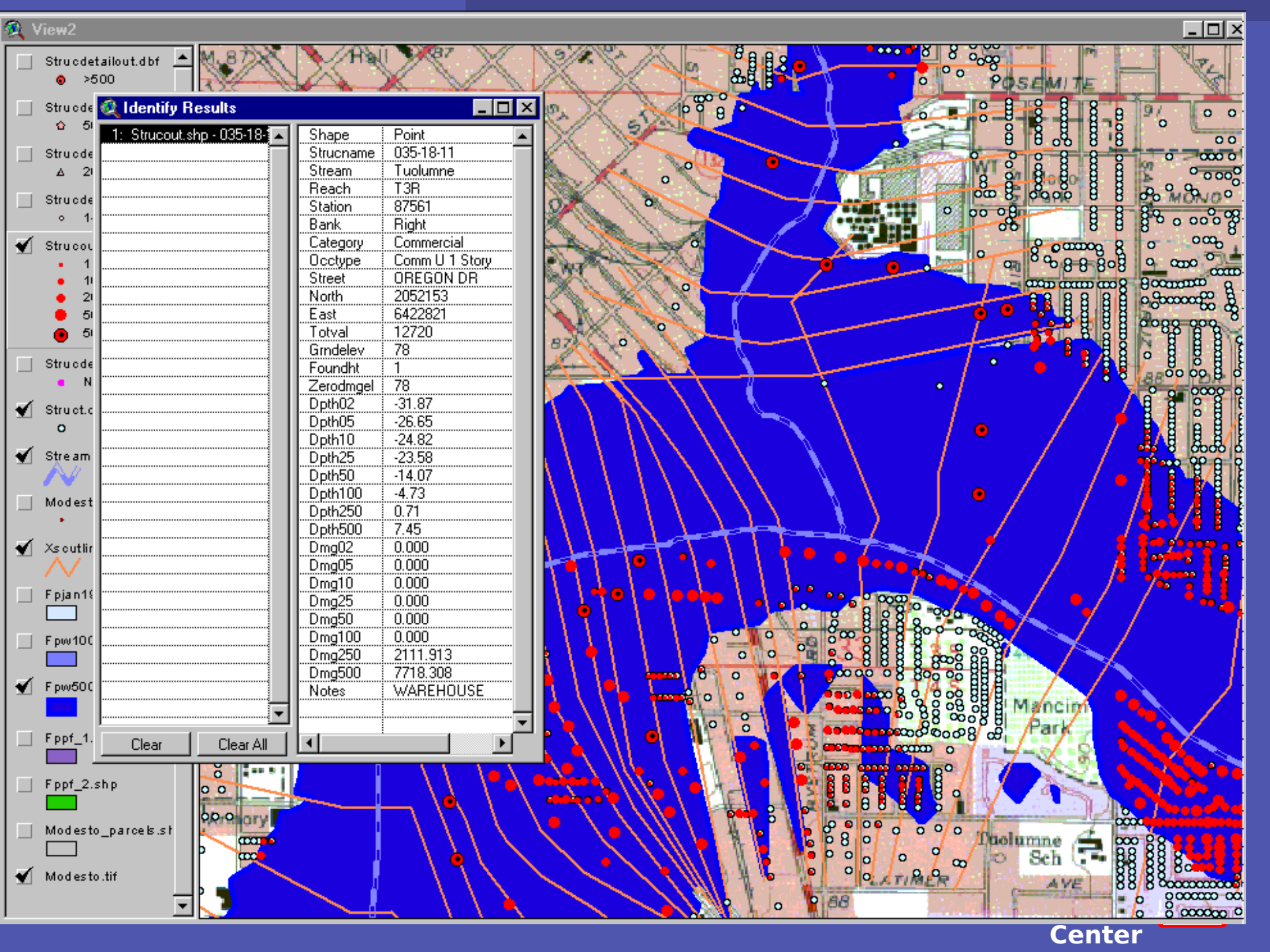
100 Year Floodplain - Depth at a parcel



Center


Aerial
Fpw500yr.shp
Fpw100yr.shp
Fpjan1997.shp
Struct.dbf
Stream.shp
Modesto_points.shp
Modesto_parcels.sh
Modo450b.sid
Identify Results
1: Struct.dbf - 102-18-01
2: Struct.dbf - 035-16-08
3: Modesto_points.shp - 035-16-08
Shape Point
Fd_id 20799
Fd_name 035-16-08
Fd_desc
St_year -901
St_damcat 20
St_strm 19908
St_bank 0
St_statn 3238.210
St_module 1
St_1f_flag 0
St_1f_stg
St_grndstg 76.53
St_deltag 1.00
St_deltaz -901.00
St_dmgfun 21738
St_strval 4071.80
St_conval 6107.70
St_othval -901.00
St_street FAIRBANKS AV
St_city
St_state
St_zip
St_north 2053642.74
St_east 6421421.81
St_zone -901.00
St_numstr 1
St_drid -1
St_reffld -901.00
Clear
Clear All


Parcels
Stream.shp
Strucout.shp
0.1 - 1
10.001
20.001
50.001 - 500
500.001 - 165
Struct.dbf
Fpq9kcfs.shp
Struc100yr.shp
Fpjan1997.shp
Fpw100yr.shp
Fpw500yr.shp
Struc20kcfs.shp
Struc.shp
0 - 150
300
300 - 500
500 - 1000
1000 - 154519
Fpq20kcfs.shp
Modesto_points.shp
Modesto_parcels.sh
Modesto.tif
Structure Value
Municipal Golf Course
Golf Course
Mancini Park
Tuolumne Sch
Trailer Park
Fire Station
Orville Sch
West Side Park
Dryden Park Municipal Golf Course
Shackleford Sch
LATIMER AVE
SOUTHERN
MONO DR
OREGON
BLVD
WAY


View2
Strucdetailout.dbf
>500
Identify Results
1: Strucout.shp - 035-18-
Shape Point
Strucname 035-18-11
Stream Tuolumne
Reach T3R
Station 87561
Bank Right
Category Commercial
Occtype Comm U 1 Story
Street OREGON DR
North 2052153
East 6422821
Totval 12720
Grndelev 78
Foundht 1
Zerodmgel 78
Dpth02 -31.87
Dpth05 -26.65
Dpth10 -24.82
Dpth25 -23.58
Dpth50 -14.07
Dpth100 -4.73
Dpth250 0.71
Dpth500 7.45
Dmg02 0.000
Dmg05 0.000
Dmg10 0.000
Dmg25 0.000
Dmg50 0.000
Dmg100 0.000
Dmg250 2111.913
Dmg500 7718.308
Notes WAREHOUSE
Clear
Clear All
Fppf_2.shp
Modesto_parcels.sh
Modesto.tif
YOSEMITE
Park
Tuolumne
Sch
AVE

Center

FY 2003 Plans

- Release “beta” version of flood impact methodology with documentation (HEC-FDA 2.0)
- Release Version 2.0 HEC-FDA with documentation
- Incorporate new methods into training and tech transfer